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THE INTER-INDUSTRY FLOW OF GOODS
AND SERVICES
CANADA, 1949



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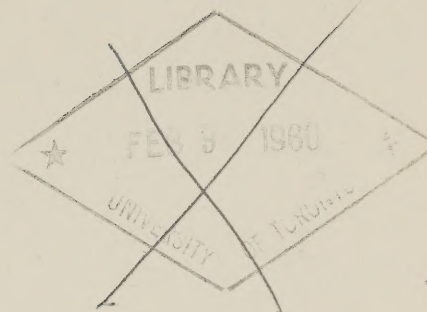
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SUPPLEMENT TO
THE INTER-INDUSTRY FLOW OF GOODS
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CANADA, 1949

Supplement to
Reference Paper No. 72

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Research and Development Division

Research Projects Section

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Supplement to the Inter-Industry Flow
of Goods and Services, Canada, 1949

Table 3, column 1, row 11 should read .081573
instead of .081753

DOMINION BUREAU OF STATISTICS

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Research Projects Section

SUPPLEMENT TO
THE INTER-INDUSTRY FLOW OF GOODS AND SERVICES
CANADA, 1949

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PREFACE

The publication of the revised *National Accounts, Income and Expenditure, 1926-1956* in 1958 changed some of the figures in *The Inter-Industry Flow of Goods and Services, Canada, 1949* (Reference Paper No. 72), which had been published in 1956. This Supplement to the latter publication incorporates these revisions and also makes a change in the method of routing commodities through distributive channels from producer to user. The change from a system of purchasers' prices to producers' prices simplifies some analytical uses of an inter-industry flow table and also enables the user to relate output totals in the table more closely to other production figures published by the Dominion Bureau of Statistics. This Supplement is self-contained since it repeats all the relevant explanations of concepts, sources, and methods contained in the earlier publication. In addition, this Supplement includes seven new tables, Tables 3-9.

The calculation of Table 3 was performed by Professor T.I. Matuszewski at the Computing Centre of the University of British Columbia while he was a member of the Institute for Economic Research at Queen's University, Kingston. This calculation made possible Tables 4 and 5 which give estimates of the primary input content of final output, and the gross domestic product content of final output by industry.

The estimates of exports and imports by industry contained in Tables 6-9 were prepared by Mr. A.A. Tooms. The study of the inter-industry flow of goods and services is under the direction of Mr. J.A. Sawyer, Chief of the Research Projects Section, Research and Development Division.

October 26, 1959

WALTER E. DUFFETT,
Dominion Statistician.

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SYMBOLS AND ABBREVIATIONS

The interpretation of the symbols or abbreviations used in the tables in this publication is as follows:

- This symbol is used to indicate that the entry in a cell of a table is defined to be zero by the conceptual framework or that the total has no analytical significance.
- This symbol is used where the entry in a cell is estimated to be zero or where the amount is too small to be shown in the units of a table.

... Figures not applicable.

c.i.f. Cost, insurance, and freight.

f.o.b. Free on board.

n.e.s. Not elsewhere specified (or included).

SUPPLEMENT TO

THE INTER-INDUSTRY FLOW OF GOODS AND SERVICES

CANADA, 1949

I. THE CONCEPTUAL FRAMEWORK OF THE INTER-INDUSTRY FLOW TABLE

The *National Accounts, Income and Expenditure* represented an important advance in Canadian economic statistics by presenting the measurement of the nation's output during a period of time in the form of a set of balancing accounts. This procedure, which is analogous to the practice of businessmen in setting up their statements in the form of balancing accounts, was extended to include separate revenue and expenditure accounts for broad sectors of the economy: persons, governments, and business. This study of the inter-industry flow of goods and services (input-output table) is an application of the same technique to the study of the disposition of output of industries and of the origin of the materials, supplies, and services used in producing that output.¹

A. The Concept of Industry

The term "industry" is used in this study to include all productive activity carried on in the economy except for non-commercial work done in a household. This definition of industry is the same as that used in the Dominion Bureau of Statistics, *Standard Industrial Classification Manual* and includes the public administration and defence industry as well as persons or associations of individuals who hire employees or otherwise engage in industrial transactions.²

In the case of a firm or enterprise which carries on a variety of activities, a problem of dividing the firm into a number of homogeneous units suitable for input-output studies arises. To attempt to define each separate production process or activity as the basic unit means, in most cases, adopting a unit of the firm which is smaller than the unit used for accounting purposes. Most firms which produce commodities do not keep separate statistics for each production process on shipments, inventories, employment and payrolls, and materials,

process supplies, fuel, and electricity used. In most cases, however, such statistics are available for each establishment (factory, farm, mill, mine, and so forth). The basic unit classified by an industrial classification is, therefore, the establishment—the smallest unit within the firm for which all the above-mentioned industry statistics are available separately. For service establishments, a comparable set of output and input statistics must be available.

An industry is a group of establishments which have sufficient common characteristics that they may be grouped together for analytical purposes. They may, for example, manufacture similar end products (the furniture industry) or use the same principal component material (the wood products industry). Sometimes it is the technological process that is similar (rolling mills).

If a manufacturing establishment produces two products, for example, trucks and agricultural implements, its classification depends on which of these two products constitutes the greater proportion of its gross value of production. If this were trucks, all the output of the establishment would be classified to the transportation equipment industry. If agricultural implements came to constitute the larger proportion of the gross value of output, the establishment would be reclassified to the agricultural implements industry.

The table divides the economy into forty-two industries, which are a grouping of industries listed in the D.B.S. *Standard Industrial Classification Manual* (see Table 10, page 26). Because of data problems, however, certain deviations from the principle of making the establishment the basic unit of the table have been necessary. They are explained in detail in Part IV.A.

The D.B.S. Census of Manufacturing Industries for 1949 was a census of manufacturing activity rather than a census of all activities carried on in manufacturing establishments. The only activities included in manufacturing are the manufacture or repair of products and some distribution activity associated with the shipment of these goods. Examples of activities carried on in manufacturing establishments upon which complete data were not collected in 1949 are the purchase and sale of goods without further processing, the operation of trucking fleets, operation of cafeterias, and the performance of construction with an establishment's own labour force. With these exceptions, however, manufacturing in the inter-industry table is defined on an establishment basis.

¹ The inter-industry flow table is an extension of the system of National Accounts and it will be assumed that the reader is familiar with the concepts of the D.B.S. National Accounts. See D.B.S. Publication 13-502, *National Accounts, Income and Expenditure, 1926-1956*, Parts II.B and II.D.

² See D.B.S. Publication No. 12-501, *Standard Industrial Classification Manual* (1959 edition). The preface to this edition of the Manual contains a statement of the principles of industrial classification. Although the industrial classification of the 1949 inter-industry flow table follows the 1948 edition of the Manual, some of the terminology of the 1959 Manual is used. Thus the "government service" industry is now termed the "public administration and defence" industry, the "public utility operation" industry is now the "electric power, gas, and water utilities" industry, and the "non-ferrous metal smelting and refining" industry is now simply the "smelting and refining" industry.

The difference between classifying on an activity basis and an establishment basis can be illustrated by trucking. Assume that a manufacturing establishment has its own trucking fleet which is used to distribute its products. Under an establishment classification the gasoline, oil, depreciation, and other expenses would be shown as inputs into the manufacturing industry. Under an activity classification this transportation activity would be transferred to the transportation industry and these items would be shown as inputs into the transportation industry. The manufacturing industry would be shown as consuming an input from the transportation industry equal to the cost of operating its own trucks during the year. In the 1949 table, transportation is on an establishment basis as far as the available data permit.

All construction activity, on the other hand, whether new or repair, or whether put in place by contractors or by the labour force of establishments whose principal activity classifies them to other industries, has been included in the construction industry. The main reason for this was that the allocation to the industry of origin of the materials used in construction activity was made by estimating the disappearance of construction materials. No data were available on an establishment basis for the use of construction materials for construction work done on "own account" by manufacturing industries and many service industries; neither was it possible to separate materials used for new construction from materials used for repair. Since all construction activity (including repair) is included in the construction industry, all other industries have been defined to exclude construction activity carried on by their own labour forces. This required that adjustments be made to wages and salaries in each industry to exclude the wages paid to its own labour force for repair or new construction.

B. Definition of Output

The output of industries consists of new goods and services brought into existence through the transformation of materials, labour, capital, and other inputs. Output which is used by the establishment producing it is excluded, however, from its total output figure. For example, if within the same establishment cotton thread were manufactured and then used to weave fabrics, only the fabrics would be counted as output—the thread would be an intermediate product of the establishment which would not be counted. The output of a manufacturing establishment during a period of time can be measured by its shipments (sales plus transfers to other plants within the same company), plus the increase (or minus the decrease) in its inventory of finished products of own manufacture, plus the increase (or minus the decrease) in goods in process during the period.

In addition to the qualifications to the definition of industry output introduced by the partial modification of the establishment basis to

an activity definition, the receipt of investment income by establishments required special treatment. The output of an industry is measured by the total revenue received from its operating activities (the production of goods and services); non-operating revenue such as capital gains and losses and the receipt of interest and dividends are excluded from the measure of output.³ The table therefore shows all interest and dividends paid as if they were paid directly to persons, governments, or non-residents; that is, as gross domestic product originating in the industry paying them. Thus, this return to capital is shown in the industry where the capital is used to produce goods and services, not where it is owned. This treatment of investment income and the resulting definition of the output of financial institutions is identical with that followed in the *National Accounts*.⁴

An item of investment income which was treated specially was gross rents paid on non-residential buildings.⁵ Three possible ways of treating payment of rent in the inter-industry flow table were considered: (i) The first possibility is to consider gross rent as an intermediate input into an industry which is paid to the industry which actually owns the building or equipment. The net rent (gross rent less expenses) would then be shown as originating in the industry which owned the property. For example, if a retail trade establishment is renting a store which is owned by an establishment classified in the chemical products industry, the gross rent is shown as a payment by retail trade to the chemical industry. This alternative reflects as closely as possible the actual institutional arrangements in the economy and is the method followed in the industrial distribution of national income in the *National Accounts*. (ii) It can be argued that renting is an alternative way of obtaining the use of capital equipment. A firm might have borrowed money and purchased the land or building outright instead of renting. According to this argument the net rent would be shown as income originating in the industry where the capital equipment was used to produce goods or services and the expenses shown as input into that industry. The total income originating in the industry would then represent the return to the factors of production actually used in producing the goods and services produced in an industry. In the above example, the net rent would be shown as originating in retail trade; the chemical industry would not appear in the transaction. (iii) The third method, and the one actually used for the inter-industry flow table, is to

³ The profits figures contained in row 49 of the table are derived from Department of National Revenue, *Taxation Statistics*. Dividends from Canadian corporations are already excluded from these profit figures. Arithmetically, the exclusion of other dividends and interest from revenue was accomplished by subtracting interest and dividends received from interest paid.

⁴ See D.B.S. *National Accounts, Income and Expenditure, 1926-1956*, pp. 123 and 129.

⁵ No imputations are made in the *National Accounts* for rent on owner-occupied non-residential business buildings. The net rent is implicit in business profits.

set up a "dummy" industry within the real estate group which would receive all rents and purchase all inputs associated with the rental of buildings. In the above example, the retail trade store would be shown as paying rent, not to the chemical industry, but to the real estate industry. It was agreed that the table should follow the *National Accounts* as much as possible in reflecting the institutional arrangements but it was also agreed that it was desirable to keep as closely as possible to a definition of industry output which excludes all investment income. The device of showing all rents as being paid to the real estate industry was therefore adopted.

C. Channels of Distribution and Valuation of Output

The method used to show the distribution channels through which goods flow from the manufacturer or other commodity-producing industry to the user requires explanation. It was decided to show a direct link between producer and user rather than to complicate the tracing of goods through the table by showing the various distribution channels through which they flow. Two methods of short-circuiting the flow through transportation, storage, and trade channels are possible. The method adopted in this publication is known as the "producers' price" method. According to this method a consumer who purchases, for example, a bar of soap at a retail store is shown as if he paid directly to the manufacturer the manufacturer's selling price for the soap and then paid to the transportation, storage, and trade industry (row 38 in Table 1) the amount of wholesale and retail trade margins, transportation, and other distribution costs. Taxes levied after the manufacture of the soap was completed are shown as a separate payment (row 46), as are taxes or customs duties on imported goods (row 45). The value of output of a manufacturing establishment is therefore defined as the selling value of its products, excluding excise taxes and excise duties. The output of a trade establishment is defined as its gross margin, i.e. net sales less the cost of goods sold. Packaging and other materials used in the preparation of commodities for sale by trade establishments are included in their gross margin and shown as inputs into the trade industries. Section F illustrates this method of constructing an inter-industry flow table.

The alternative method of routing commodities in an inter-industry flow table, that of "purchasers' prices" was used in Reference Paper No. 72 and the interested reader may refer to pages 10 and 14 of that publication for an illustration of such a system.

D. Disposition of Output

The table has one row for each industry which shows the disposition of the output of that particular industry. Output has been divided into two

parts: intermediate output and final output. Intermediate output represents the materials, supplies, and services used by other establishments during the year in producing their output; thus, intermediate output of one industry is input into another industry. Each inter-industry cell therefore represents two ways of looking at the same transaction. Another feature of the table is that inter-industry input and output have been classified according to the same forty-two industries so that the use of intermediate output is shown on a "from-whom-to-whom" basis. This feature of the table gives it its name, "inter-industry flow of goods and services".

If an industry purchased one hundred units of a material during the year but used only ninety units, the remaining ten units represent an increase in its raw material inventories. The figure which will be entered in the appropriate inter-industry cell of Table 1 will be the ninety units used, not the one hundred units purchased. The remaining ten units are treated as final output of the year and included in the change in inventory column (column 48) and in the row of the industry which produced these materials.

Final output is defined to include all gross national expenditure categories, except for imports which are treated as an input. The final output categories are expenditure by persons on consumer goods and services, expenditure by governments on goods and services, business gross fixed capital formation (business expenditure on new construction and new machinery and equipment), the value of physical change in inventories, and the export of goods and services.⁶ The entry in the inventory change column for a particular industry is the total value of the physical change in all inventories of the products of that industry, regardless of which industry holds them or which industry owns them. The total residual error of estimate, which is the difference between the two largely independent estimates of gross national product made for the *National Accounts*, appears in the inter-industry flow table as a category of final output.

E. Origin of Input

Each column of the table shows the origin of input into an industry. All components of the value of output of an industry (including profits or losses) are included as inputs into the industry so that the value of total input will be identical to the value of total output. (The total input figures in row 53 of Table 1 are identical with the industry output figures in column 52.)

In Table 1, the inputs into each industry have been arranged in such a way that the gross domestic

⁶ The categories of gross national expenditure are defined in D.B.S., *National Accounts, Income and Expenditure, 1926-1956*, pp. 107-110.

product at factor cost⁷ originating in each industry is shown as a sub-total. If complete data were available, the gross domestic product at factor cost could be derived by subtracting from the total value of output of an industry (f.o.b. the producing establishment and excluding excise taxes and excise duties) the cost of the various inputs which have been used in producing that output and which have been obtained from other industrial establishments in Canada or imported from other countries. Gross domestic product at factor cost excludes all indirect taxes; therefore all custom import duties and excise taxes and duties on materials and supplies used and all other taxes reflected in the value of output, such as property taxes, must also be deducted.

In Table 1, imports are shown as inputs entering the economy into the industry in which they are first used. The inter-industry flow table therefore distinguishes the extent to which materials or services used are obtained from domestic sources or from foreign sources.⁸

The relation between the gross domestic product at factor cost and total final output can be seen from Table 1:

Total final output	\$20,156 million
Less:	
Imports of goods and services	3,463
Indirect taxes on imported goods and services	290
Indirect taxes less subsidies on domestic goods and services	1,518
Gross domestic product at factor cost	\$14,885 million

The entries on the principal diagonal of Table 1 require further explanation. Total output in Table 1 has been defined to include products used by other establishments within the same industry.⁹ These

⁷ For a discussion of this concept see D.B.S. *National Accounts, Income and Expenditure, 1926-1956* (Ottawa, 1959), page 113 (footnote 24) and pages 134-138. The components of gross domestic product are defined on pages 110-119. The industrial distribution of gross domestic product in the inter-industry flow table differs from Table 21 of the *National Accounts* in the following respects: (i) the classification of net rents, (ii) the classification of construction, and (iii) the classification of investment income and capital consumption allowances which are on an establishment basis in the inter-industry study but on an enterprise or company basis in the *National Accounts*.

The concept of "value added by manufacture" which appears in the publications relating to the D.B.S. Census of Industry is obtained by subtracting only the cost of materials, fuel and electricity used from the value of output. This concept of value added therefore contains some expenditure on the products of other establishments and does not add to an unduplicated measure of value added for the whole economy. The gross domestic product concept does not contain this duplication.

⁸ Import data are discussed more fully in Part III of this publication.

⁹ The agriculture, metal mining and smelting and refining, and primary iron and steel industries are exceptions. See the definition of output for these industries in Part IV.

appear in the table both as an output and as an input of the same industry. This intra-industry consumption is not included in the total output figures in Tables 2 and 3 in Part II.

F. An Illustration of the Inter-Industry Flow of Goods and Services

A simple example may serve to illustrate how the transactions relating to the production and use of goods and services can be entered into an inter-industry flow table. To simplify the illustration, it is assumed that only a few inputs are used to produce the products and that there are no imports and no indirect taxes. Assume that wheat produced by agriculture was used by the grain mill products industry to make flour, and the flour was then used by a baker to make a cake which was ultimately sold to a housewife. Agriculture also produces sugar beets which were used by the confectionery and sugar refining industry to produce sugar which was used by the baker in making the cake. If the housewife paid 25 cents for the final product, the cake, this amount would appear in an inter-industry table which had been constructed at producers' prices as personal expenditure on consumer goods and services (row 12, column 7 in the table on page 11). If the selling price of this cake at the bakery was 23 cents and the transportation, storage, and trade margins amounted to 2 cents, these figures would appear in rows 3 and 5 respectively of the table. The total output of the bakery products industry is shown as 23 cents (row 3, column 9). The inputs used to produce this output are shown in column 3. For this example it has been assumed that the cost of the flour, f.o.b. the grain mill was 14 cents; the cost of the sugar, f.o.b. the refinery was 3 cents; that transportation, storage, and trade margins involved in delivering these materials to the bakery amounted to 1 cent, that the bakery paid 3 cents in wages, salaries, and supplementary labour income to its employees; and that capital consumption allowances of 1 cent were charged, leaving for the bakery, which is assumed to be incorporated, a net profit of 1 cent.

There were two material inputs into the bakery which were outputs of other industries. The input of sugar, in this example, represents the total output of the confectionery and sugar refining industry and the inputs used to produce this output are shown in column 4. It is assumed that the cost of the sugar beets, f.o.b. the farm, was 1 cent and that the transportation, storage, and trade margins were less than ½ cent. The wages, salaries, and supplementary labour income paid by the refinery are assumed to have been 1 cent and again it is assumed that corporation profits amounting to 1 cent were earned. Similarly the inputs used to produce the flour are shown in column 2. It is assumed that the cost of wheat, f.o.b. the farm, was 8 cents and that transportation, storage, and trade margins involved in distributing the wheat amounted to 2 cents. Wages, salaries, and supplementary labour income paid by the mill are assumed to be 1 cent and capital consumption allowances of 2 cents were charged leaving a corporate profit of 1 cent.

	1	2	3	4	5	6	7	8	9
For the disposition of output of an industry, read the row for that industry.									
For the origin of input into an industry, read the column for that industry.									
(Producers' prices in cents)									
	Agriculture	Grain mill products	Bakery products	Confectionery and sugar refining	Transportation, storage, and trade	Total intermediate output (Columns 1+...+5)	Personal expenditure on consumer goods and services	Total final output (Column 7)	Total output (Columns 6+8)
1. Agriculture		8		1		9			9
2. Grain mill products			14			14			14
3. Bakery products				3			23	23	23
4. Confectionery and sugar refining			3			3			3
5. Transportation, storage, and trade		2	1	--		3	2	2	5
6. Sub-total (Rows 1+...+5)		10	18	1					--
7. Wages, salaries, and supplementary labour income	6	1	3	1	2				13
8. Investment income		1	1	1	1				4
9. Net income of unincorporated business	1				1				2
10. Capital consumption allowances and valuation adjustments	2	2	1		1				6
11. Gross domestic product at factor cost (Rows 7+...+10)	9	4	5	2	5				25
12. Total input (Rows 6+11)	9	14	23	3	5	--	25	25	

Agriculture in this simplified example had two products—wheat and sugar beets. The total output of agriculture (row 1, column 9) is therefore the sum of the value of these two products, 9 cents, and the inputs shown in the column for agriculture are the sum of the inputs used to produce these two products. It is assumed that no material inputs were used and that wages, salaries, and supplementary labour income amounting to 6 cents were paid and capital consumption allowances of 2 cents were charged, leaving for the farmer, who was assumed to be an unincorporated proprietor, a net income of 1 cent.

In the distribution of the various commodities which entered into these inter-industry and final output transactions, transportation, storage, and trade margins amounting to 5 cents were incurred. This represents the total output of the transportation, storage, and trade industry (row 5, column 1) and the inputs used to produce this output are shown in column 5 of the table. Again for simplicity it is assumed that no material inputs were used and that the only costs were wages, salaries, and supplementary labour income and capital consumption allowances. It is also assumed that all the establishments in this industry were unincorporated.

G. Summary

The inter-industry flow table for 1949 shows: (i) the industry of origin of domestically-produced materials, supplies, and services which were used in 1949 by the various industries, (ii) the use of

imported goods and services by industries, (iii) the incomes earned by the factors of production in each industry, and (iv) the industry of origin of final output. Conceivably, the table could be set up in terms of physical units of commodities and services; however, because of the desirability of making input and output for an industry add to the same total, the flows are expressed in terms of the average prices prevailing in 1949.¹⁰

It must be remembered that a large number of possible productive techniques existed and the table shows only the set of inputs which were actually used in 1949. For example, the relative price structure plays an important role in determining the productive techniques which are actually selected from the possible alternatives which exist in a particular year. If a different set of relative prices had existed in 1949, a different combination of commodities and services might have been chosen to produce the nation's output.

¹⁰ Within 1949 prices were relatively stable. The value of gross national product at market prices increased by 8% during the year; 4% of this increase was attributable, however, to an increase in the physical volume of output (partially a result of Newfoundland's entry into Confederation). The general wholesale price index declined gradually by approximately 2.5% during the first three quarters of the year and then rose by 1% during the last quarter. Most of the movement was in the farm products, raw materials, and food components, the manufactures group being more stable. The consumer price index rose by 1.2% during the first eleven months and declined by almost 0.5% during the last month.

II. THE PRIMARY INPUT CONTENT OF FINAL OUTPUT

An inter-industry flow table provides a method of relating expenditure on final output to the intermediate output of Canadian industries and then to imports, indirect taxes, and the various components of gross domestic product at factor cost such as wages, salaries, and supplementary labour income. That the sum of these inputs is equal to total final output is easily demonstrated. Total output of an industry is equal to total input into the industry. As was explained in Part I, total output of an industry consists of final output plus intermediate output while its input consists of the intermediate output of domestic industries used by that industry, wages, salaries, and supplementary labour income and other components of gross domestic product, imports, and indirect taxes. For convenience, the inputs which are not intermediate output of domestic industries may be termed "primary input."¹¹ For the economy as a whole it can be seen that, when intermediate output is cancelled out both on the output side and the input side, total final output equals total primary input. This identity between total final output and total primary input is similar to the identity between gross national expenditure and gross national product in Tables 1 and 2 of the *National Accounts*. The following analysis may therefore be considered as an attempt to relate imports and specific components of gross domestic product to specific items of gross national expenditure through inter-industry analysis.

A. Estimation of the Average Input Content of 1949 Final Output

Before discussing a general method of estimation, it might be helpful to follow through, step-by-step, the relation of intermediate industrial output and items of primary input such as imports or wages, salaries, and supplementary labour income to specific items of final output. Consider total business gross fixed capital formation which in 1949 amounted to \$3,032 million. As can be seen from the entry in row 37 of column 47 of Table 1, \$1,714 million of this represented new construction; the remaining \$1,318 million comprised expenditure on machinery and equipment. Data published in D.B.S., *Private and Public Investment in Canada, 1946-1957* (Ottawa, 1959) show how much expenditure was made by each industry. Column 47 of the inter-industry flow table, on the other hand, contains an allocation of this amount according to the industries which produced the goods. For example, the entry in row 32 of column 47 says that, of the total expenditure on machinery and equipment of \$1,318 million, expenditure at producers' prices on the products of the electrical apparatus and supplies industry amounted to \$109 million.¹² What were the repercussions of this expenditure on the inputs into the electrical apparatus industry and therefore on the intermediate output of other industries and upon primary inputs?

It should be noted that the table does not distinguish which inputs into the electrical appara-

tus industry were used in making the products that entered into expenditure on machinery and equipment, or personal expenditure, or exports, or intermediate output. This is because the basic unit of the table is the establishment and the table distinguishes only the inputs into an establishment and the products which came out of that establishment. If it were possible to distinguish the inputs relating to the various production processes within an establishment, this problem could be partially overcome. As long as joint production exists, however, the problem will exist. In the particular example being examined, a breakdown of the electrical apparatus group into its component industries might serve to further separate the effects of machinery and equipment expenditure. The possibility of making estimates for finer industrial classifications may be investigated as part of further input-output research. At present, however, to trace the effects of expenditure on final output upon inputs, it is necessary to make some assumption about the relation of specific inputs to specific outputs. The following computations are based on the assumption that the same inputs are used in the same proportion for all components of an industry's output.

As can be seen from Table 2, to produce one hundred dollars' worth of output (excluding output of the electrical apparatus industry used within the industry¹³) the electrical apparatus industry, on the

¹³ As was noted earlier, in some industry groups intra-industry consumption was partially or completely eliminated from Table 1 (agriculture, metal mining and smelting and refining, and primary iron and steel). Moreover, when companies within an industry are vertically integrated, the inclusion of intra-company consumption in Table 1 depends on the presence of accounting records and whether a company reports to the Census of Industry as one establishment or as several establishments. In comparing the proportion of wages and salaries, imports, or other inputs to total output for various industries or in comparing proportions entering into various final output categories, it was felt that a more homogeneous comparison would be obtained if the total output figures excluded intra-industry consumption. For this reason the output figures in Tables 2 and 3A exclude this portion of total output. This exclusion has no effect on the figures in Table 3B and therefore on Tables 4 and 5. To raise the figures in Tables 2 and 3A to total output including intra-industry consumption each column must be multiplied by

total output including intra-industry consumption

total output excluding intra-industry consumption

These multipliers have been calculated for each of the forty-two industries (using estimates of the total output to the nearest hundred thousand dollars where possible):

Industry No.	Industry No.	Industry No.	Industry No.	Industry No.
1 1.032312	15 1.056048	29 1.078583		
2 1.000000	16 1.015654	30 1.132911		
3 1.008562	17 1.316070	31 1.100255		
4 1.000000	18 1.005644	32 1.055579		
5 1.005151	19 1.257783	33 1.040876		
6 1.000000	20 1.247606	34 1.047233		
7 1.067917	21 1.021202	35 1.088898		
8 1.027166	22 1.014110	36 1.020012		
9 1.001599	23 1.054598	37 1.000907		
10 1.025784	24 1.131350	38 1.045272		
11 1.056334	25 1.080391	39 1.100639		
12 1.000000	26 1.100685	40 1.232611		
13 1.067416	27 1.000572	41 1.109018		
14 1.025203	28 1.052294	42 1.034251		

¹¹ In Reference Paper No. 72, the term "primary input" excluded imports of goods and services.

¹² Transportation, storage, and trade margins on this output are included in row 38 of column 47 and indirect taxes, if any, are included in row 46 of column 47.

average in 1949, used \$2.66 worth of input from the iron and steel products industry (column 32, row 28), and so forth. In turn, to produce \$2.66 worth of output, the iron and steel products industry, on the average, used \$0.37 worth of input from the primary iron and steel industry (column 28, row 26). To produce \$0.37 worth of output, the primary iron and steel industry used \$0.0005 worth of input from the metal mining and smelting and refining industry group (column 26, row 4). On the basis of this proportionality assumption, it is possible, therefore, to trace the effects of final expenditure on the output of an industry upon the intermediate output of all industries.

It is interesting to note that to produce a dollar's worth of output the iron and steel products industry used \$0.01 worth of the output of the electrical apparatus and supplies industry (column 28, row 32). Thus, there is a feed-back effect on the electrical apparatus industry. To produce a dollar's worth of final output, an industry generally must also produce some intermediate output for use by other industries. In other words, by using inputs from other industries a demand for its own products is created.

By this step-by-step (or iterative) procedure, the total output of each industry resulting, on the average in 1949, from the production of a hundred dollars' worth of final output of the electrical apparatus and supplies industry can be approximated. Once this computation has been made, the primary input content of this final output can be calculated on the basis of similar averaging assumptions.

When carried out for all industries, this process of calculation involves a very large number of multiplications and is usually performed on an electronic computer. Table 3A presents the results of an electronic calculation of the total output of each industry resulting, on the average in 1949, from the production of a dollar's worth of final output by an industry for each of the forty-two industry groups shown in Table 1. From this table, it can be seen that the production of a hundred dollars' worth of final output of the electrical apparatus industry resulted in the iron and steel products industry producing an output worth \$3.18 (column 32, row 28), and the electrical apparatus industry itself producing an output worth slightly more than \$100.00 (column 32, row 32). From Table 2 it can be seen that to produce one dollar's worth of output in 1949, the iron and steel products industry used imports worth \$0.11 (column 28, row 44). This average import input coefficient can be applied to the total output figure of \$3.18 obtained from Table 3A to obtain an import content estimate of \$0.34 for this portion of output resulting from a hundred dollars' worth of final output of the electrical apparatus industry. Similarly, the import content of the output of all other industries resulting

from the production of a hundred dollars' worth of final output of this industry can be calculated; the total average import content of a hundred dollars' worth of final output of the electrical apparatus industry was \$17.79 (column 32 and row 44 of Table 3B). A similar procedure can be used to calculate estimates of the amount of the other primary inputs which were contained, on the average in 1949, in a hundred dollars' worth of final output of the electrical apparatus industry.

The presence of unallocated inputs and outputs (row 43 and column 43) complicates the analysis of primary input content. In computing Table 3A, the unallocated row and column could have been treated as a forty-third industry and the amount of unallocated output of each industry required on average to produce a dollar's worth of final output of an industry calculated. This would have involved the assumption, for example, that the large unallocated input into the iron and steel industry consisted primarily of the large unallocated output of the transportation, storage, and trade industry and of the large unallocated output of the textile industry. From the worksheets of the inter-industry study it can be determined that the unallocated input consisted largely of the item "all other materials used" reported by manufacturing establishments to the Census of Industry. Only a small portion of this would be input from the transportation, storage, and trade industry. From knowledge of the materials used in the iron and steel industry, it also appears unlikely that much of the unallocated input was output of the textile industry. For this reason it was decided not to include unallocated input and output in the calculation of Table 3A. This made it necessary to include unallocated input in Tables 3B, 4, and 5 as if it were a primary input (even though it is not) and unallocated output in Tables 4 and 5 as if it were final output (even though it is not) so that the fundamental identity that a dollar's worth of final output gives rise to a dollar's worth of primary input somewhere in the economic system would hold.

It will be noticed that in Table 3B, total primary input plus unallocated input resulting from the production of a dollar's worth of final output of an industry amounts to slightly less than one dollar. This is because of the iterative (or step-by-step) procedures used in the computation. Although the total converges to one, it takes a large number of iterations to attain the desired degree of accuracy. The calculations for column 15 and columns 19 to 42 were carried to a larger number of iterations than those for the other columns. The totals for these columns are therefore closer to unity than are those for the other columns.

If the procedure for calculating primary input content described above is applied to each component of final output and unallocated output in Table 1 and the resulting input content figures for each category of final output summed, Table 4 can

TABLE 4. The Primary Input Content of Final Output,¹ 1949

	Personal expenditure on consumer goods and services	Government expenditure on goods and services	Business gross fixed capital formation	Value of physical change in inventories	Exports of goods and services	Un- allocated output ¹	Discre- pancy	Residual error of estimate	Total
millions of dollars									
Derived primary and unallocated input content:									
Imports of goods and services.....	1,081	130	290	18	340	90	1	—	1,950
Indirect taxes on imported goods and ser- vices	70	9	25	2	18	5	2	—	131
Indirect taxes less subsidies on domestic goods and services	417	51	61	-2	67	22	--	—	615
Wages, salaries, and supplementary labour income	3,898	1,258	1,245	32	1,316	364	3	—	8,115
Investment income	1,354	183	302	16	599	116	2	—	2,572
Net income of unincorporated business	1,511	290	218	-47	583	81	1	—	2,637
Capital consumption allowances and valua- tion adjustments	932	128	140	-4	305	61	1	—	1,561
Unallocated input ¹	340	78	146	7	164	18	-2	—	752
Discrepancy	5	--	--	-1	2	--	—	—	—
<i>Total derived primary and unallocated in- put content</i>	<i>9,607</i>	<i>2,127</i>	<i>2,426</i>	<i>21</i>	<i>3,395</i>	<i>756</i>	<i>—</i>	<i>—</i>	<i>18,332</i>
Final primary and unallocated input content:									
Imports of goods and services.....	674	--	501	-13	33	318	—	—	1,513
Indirect taxes on imported goods and ser- vices	104	--	49	--	3	3	—	—	159
Indirect taxes less subsidies on domestic goods and services	840	--	55	--	--	8	—	—	903
Unallocated final output ¹	-303	--	--	41	508	--	—	87	333
<i>Total final primary and unallocated input content</i>	<i>1,315</i>	<i>--</i>	<i>605</i>	<i>28</i>	<i>544</i>	<i>329</i>	<i>—</i>	<i>87</i>	<i>2,908</i>
Total derived plus final primary and un- allocated input content	10,923	2,127	3,032	49	3,938	1,085	—	87	21,241
					per cent				
Imports of goods and services.....	16	6	27		9				16
Indirect taxes on imported goods and ser- vices	2	--	2		1				1
Indirect taxes less subsidies on domestic goods and services	12	2	4		2				7
Wages, salaries, and supplementary labour income	36	59	41		33				38
Investment income	12	9	10		15				12
Net income of unincorporated business	14	14	7		15				12
Capital consumption allowances and valua- tion adjustments	9	6	5		8				7
Unallocated ¹ and discrepancy	--	4	5		17				5
Total derived plus final primary and un- allocated input content	108	100	100	1	100	1	—	1	100

¹ Table 3A does not include the unallocated "industry." This requires that unallocated input be treated on the same basis as primary inputs and unallocated output on the same basis as final outputs for purposes of this calculation.

² Percentage distribution of this column is not meaningful for analysis.

Note: (a) Components may not add exactly to totals because of rounding.

(b) For derivation of Table 4, see page 18.

be derived.¹⁴ It will be noticed that some categories of final output have primary inputs which did not pass through industries. These appear under the label "Final primary and unallocated input content." In the case of imports (row 44 in Table 1), these represent goods and services which did not require further manufacture before being used for final output purposes. The taxes and duties on these final imports are shown in row 45, while the taxes in row 46 are excise taxes and duties, retail sales taxes, and other taxes levied on domestic goods after manufacture of the goods has been completed. These primary inputs must be added to those derived by the input-output computation. Since unallocated items were not included in Table 3A, the unallocated final outputs (row 43) are also transferred directly to Table 4. (The content of these unallocated final output items is explained in Part III and in Part IV.E.) The "Total primary and unallocated input content" figure of \$21,241 million exceeds the total final output figure of \$20,156 million in Table 1 (total of column 51) by the total unallocated of \$1,085 million. The discrepancy items in Table 4 indicate the extent to which the fact that the totals in Table 3B are less than unity had on the calculations.

The information in Tables 1, 2, and 3A can also be used to arrive at estimates of the amount of value added (gross domestic product at factor cost) by each industry which, on average in 1949, entered into each category of final output. For example, from Table 3A it can be seen that a dollar's worth of final output of the agriculture industry (such as exports) resulted, on the average in 1949, in total output by the chemical industry of \$0.02. From Table 2 it can be seen that the gross domestic product per dollar's worth of output of the chemical industry is \$0.37. From the product of these two figures it can be estimated that the GDP of the chemical industry resulting from a dollar's worth of agricultural exports was, on average in 1949, \$0.0074. The actual level of agricultural exports was \$582 million and this GDP content coefficient

can be multiplied by this amount to arrive at the 1949 level. Similarly, the GDP of the chemical industry resulting from the exports of the forestry industry can be estimated. In this fashion, the total GDP in 1949 of the chemical industry resulting from exports of all industries can be approximated and the procedure repeated for other categories of final output and unallocated output. The results of such a calculation are shown in Table 5. For the same reasons as in Table 4, this table includes unallocated output and input and a discrepancy item. The reader will notice that the total GDP for an industry shown in the total column of Table 5 is the same as the GDP for the industry shown in row 52 of Table 1. What the calculations underlying Table 5 have accomplished is to allocate this total GDP to various categories of final output.

Two aggregated inter-industry flow tables have been prepared from Table 1. One table contains sixteen industry groups—four primary industry groups, eight manufacturing industry groups, construction, and three groups of the remaining industries—plus unallocated. The second contains eight industry groups—three primary industry groups (including the electric power, gas, and water utilities industry), three manufacturing industry groups (those manufacturing industries which export over 15 per cent of their total output, those manufacturing industries which import over 15 per cent of their total input, and all other manufacturing industries), construction, and one group containing all other industries—plus unallocated. (These aggregated flow tables, and the appropriate inverse matrices which are comparable to Table 3A in that they exclude unallocated, are available upon request from the Research Projects Section of the Dominion Bureau of Statistics.)

B. Estimation of the Average Input Content of Other Compositions of Final Output

In addition to the above application of input-output analysis, some research workers have used inter-industry input-output techniques to obtain approximate answers to questions such as: (i) What might have been the effect on intermediate industrial outputs and primary inputs if a different composition of final output had been generated in the year to which the inter-industry data refer?¹⁵ (ii) To what extent can one account for observed changes in the level of specific primary inputs, such as imports, in subsequent years by changes which have been observed in the composition of final output?¹⁶ (iii) Can one project the levels of

¹⁴ By coincidence the total derived unallocated input content of \$752 million is almost equal to the unallocated intermediate output of \$756 million. This suggests an arithmetically-simple method of disposing of the derived unallocated input. The derived unallocated input content of personal expenditure on consumer goods and services in the amount of \$340 million could be taken as a percentage of the \$752 million in total derived unallocated input content of final output. This percentage figure would then be applied to the various primary input content of intermediate unallocated output dollar figures. The resulting dollar amounts would then be added to the dollar values of corresponding primary input contents of personal expenditure on consumer goods and services in the first column. Proceeding in the same manner with the other final output categories, one would distribute the whole of total derived primary input content of unallocated intermediate output over the various final output categories. A similar procedure might be used to eliminate derived primary input content of unallocated intermediate output in Table 5. The user is of course not restricted to this purely mechanical device but may make his own assumptions concerning the most satisfactory way of making the distribution.

¹⁵ Richard E. Caves, "The Inter-Industry Structure of the Canadian Economy," *Canadian Journal of Economics and Political Science*, XXIII (Aug., 1957), 313-330.

¹⁶ Research of this type was conducted by Professor T.I. Matuszewski of the University of British Columbia while he was a member of the Institute for Economic Research, Queen's University, Kingston.

TABLE 5. The Gross Domestic Product Content of Final Output, by Industry, 1949

No.		Personal expenditure on consumer goods and services	Government expenditure on goods and services	Business gross fixed capital formation	Value of physical change in inventories	Exports of goods and services	Unallocated output ¹	Discrepancy	Residual error of estimate	Total
		millions of dollars								
1	Agriculture	1,100	19	13	-67	521	14	--	--	1,601
2	Forestry	62	21	52	-24	196	9	--	--	316
3	Fishing, hunting and trapping	22	--	--	6	52	--	--	--	81
4	Metal mining and smelting and refining	21	5	18	11	395	4	--	--	455
5	Coal mining, crude petroleum and natural gas	100	8	12	-8	24	5	1	--	142
6	Non-metal mining, quarrying, and prospecting	9	4	13	3	35	4	--	--	68
7	Meat products	68	1	--	-3	11	1	--	--	77
8	Dairy products	59	--	--	-1	5	3	--	--	67
9	Fish processing	8	--	--	4	15	--	-1	--	27
10	Fruit and vegetable preparations	30	--	--	4	2	1	--	--	37
11	Grain mill products	24	--	--	-2	16	--	--	--	39
12	Bakery products	23	1	--	--	--	--	2	--	86
13	Carbonated beverages	25	--	--	--	--	4	-1	--	29
14	Alcoholic beverages	87	--	--	1	17	--	--	--	106
15	Confectionery and sugar refining	48	--	--	--	1	1	-1	--	49
16	Miscellaneous food preparations	31	--	--	-1	4	--	--	--	34
17	Tobacco and tobacco products	31	--	--	2	2	1	1	--	37
18	Rubber products	40	2	5	-2	11	8	--	--	63
19	Leather products	80	--	--	--	4	--	-1	--	85
20	Textile products (except clothing)	160	4	6	1	21	49	--	--	239
21	Clothing (textile and fur)	272	1	1	7	2	8	-1	--	290
22	Furniture	53	4	11	--	2	1	1	--	72
23	Wood products (except furniture)	43	25	74	--	93	10	--	--	245
24	Paper products	83	18	21	-2	279	8	-1	--	407
25	Printing, publishing, and allied industries ..	116	47	7	-1	11	8	--	--	189
26	Primary iron and steel	32	11	41	--	37	11	--	--	130
27	Agricultural implements	1	--	26	5	38	--	--	--	71
28	Iron and steel products, n.e.s.	133	44	154	14	67	5	--	--	418
29	Transportation equipment	188	20	113	33	93	8	--	--	454
30	Jewellery and silverware (incl. watch repair) ..	16	--	--	1	1	1	-1	--	19
31	Non-ferrous metal products, n.e.s.	19	7	24	--	13	5	1	--	69
32	Electrical apparatus and supplies	90	16	86	1	21	2	1	--	217
33	Non-metallic mineral products	33	14	39	4	17	10	--	--	117
34	Products of petroleum and coal	49	5	9	-2	17	2	--	--	80
35	Chemicals and allied products	99	12	22	6	54	4	1	--	199
36	Miscellaneous manufacturing industries	49	12	10	1	8	1	1	--	82
37	Construction	188	206	647	--	35	12	1	--	1,090
38	Transportation, storage, and trade	1,707	168	379	3	515	378	1	--	3,152
39	Communication	141	25	13	1	16	4	--	--	201
40	Electric power, gas, and water utilities	176	25	19	1	49	6	1	--	277
41	Finance, insurance, and real estate	1,019	38	48	-1	62	16	1	--	1,183
42	Service industries	1,098	1,092	42	1	40	14	1	--	2,289
	Gross domestic product at factor cost (Rows 1+...+42)	7,695	1,858	1,904	-3	2,803	621	7	--	14,885
	Imports of goods and services	1,755	130	791	5	373	408	1	--	3,463
	Indirect taxes on imported goods and services	174	9	74	2	21	8	2	--	290
	Indirect taxes less subsidies on domestic goods and services	1,257	51	116	-2	67	30	--	--	1,518
	Unallocated ¹	37	78	146	48	672	18	-2	87	1,085
	Discrepancy	5	--	--	-1	2	--	--	--	--
	Total derived plus final primary and unallocated input content	10,923	2,127	3,032	49	3,938	1,085	--	87	21,241

¹ Table 3A does not include the unallocated "industry." This requires that unallocated input be treated on the same basis as primary inputs and unallocated output on the same basis as final outputs for purposes of this calculation.

Note: (a) Components may not add exactly to totals because of rounding.

(b) Row number refers to corresponding row in Table 1.

(c) For derivation of Table 5, see page 18.

intermediate industrial output and of specific primary inputs on the basis of forecasts made of the future composition and level of final output?¹⁷

In using base-period inter-industry flow tables for this type of analysis, the problem of making some appropriate assumption about the relation of industrial input to output again arises. Where no other data have been readily available in a form suitable for inter-industry analysis, researchers have assumed that the 1949 average input-output ratios were applicable and have applied the coefficients in Table 3 to the final output compositions derived for their particular problem. When using final output compositions or industrial output totals referring to years other than 1949, the effect of price changes were eliminated as far as possible so that the use of the 1949 input-output ratios implied the assumption that the ratio of input to output in 1949 dollars remained constant.

The use of constant input-output ratios to analyze the effect of changes in the composition of final output upon industrial intermediate output and primary inputs leaves some questions unanswered. Among these are: (i) To what extent would changes in the quantity of input be met through inventory change rather than by current production? (ii) To what extent would an increase in output in an industry require an increase in plant and equipment either in that or other industries? To answer these questions would require statistics on the physical stock of plant, equipment, and inventories and a theory relating changes in output to changes in the stock of inventories and capital equipment. The importance of inventory change will depend, of course, on whether the problem is one of the short-run or the long-run. In the long-run, the buffer effect of inventory change on the output of industries will disappear, whereas, in the short-run, changes in the quantity of input may be met by inventory change without causing a change in output of the industry which produces the input. (iii) To what extent will change in relative prices cause substitution of one input for another?¹⁸

Some statistics on final output and industrial output in 1949 dollars are available annually from D.B.S. publications. The annual totals of each category of final output are published in Table 5 of

¹⁷ Richard E. Caves and Richard H. Holton, *The Canadian Economy: Prospect and Retrospect*, Harvard Economic Studies, Vol. CXII (Cambridge, Mass.: Harvard University Press, 1959), Chapter 14.

¹⁸ Some further description of the characteristics and limitations of the 1949 table (at purchasers' prices) for input-output analysis are contained in John A. Sawyer, "The Measurement of Inter-Industry Relationships in Canada," *Canadian Journal of Economics and Political Science*, XXI (Nov., 1955), 480-497 and in a Note by D.H. Steinthorson, *Ibid.*, 533-534.

the *National Accounts*¹⁹ and further detail on the composition of personal expenditure at purchasers' prices is available in Table 48. The annual change in the gross domestic product at factor cost in 1949 dollars is estimated by the Index of Industrial Production (1949 = 100), which is published in the *Canadian Statistical Review*.²⁰ Although this index estimates the change in GDP, it can be used to estimate the change in industry output if the assumption implicit in input-output analysis is made: that is, that the ratio of the GDP originating in the industry to the output of the industry remains unchanged in constant dollars. This index covers mining, manufacturing, and electric power and gas utilities. The Agriculture Division publishes an Index of Farm Production.²¹ Production indices for other industry groups are not yet available. D.B.S. plans, however, to publish within the next few years an expanded Index of Industrial Production which will cover all industries in the economy.

For years other than 1949, published output figures (or estimates derived from published figures), after being classified on the basis of the inter-industry flow table (Table 10), must be adjusted to exclude intra-industry consumption when used in conjunction with Tables 2 and 3 for purposes of input-output analysis. Under the assumption that intra-industry consumption for the year in question was the same proportion of total input for each industry as in 1949, this is accomplished by multiplying the output total for an industry by the reciprocal of the appropriate figure contained in footnote 13, page 12.

¹⁹ The figures for exports and imports of goods and services published in the *National Accounts* are on a national, rather than a domestic, product basis. To convert them to a domestic basis requires that income from non-residents be subtracted from exports and incomes paid to non-residents be subtracted from imports. The domestic figures are as follows:

	Exports of goods and services	Imports of goods and services
	(millions of 1949 dollars)	
1949	3,938	3,463
1950	3,915	3,752
1951	4,282	4,299
1952	4,716	4,525
1953	4,658	4,909
1954	4,481	4,632
1955	4,824	5,325
1956	5,216	6,220
1957	5,231	6,096
1958	5,270	5,691

²⁰ This Index is described in D.B.S. Publication 61-502, *Revised Index of Industrial Production, 1935-1957* (1949 = 100).

²¹ See D.B.S. Publication 21-203, *Index of Farm Production*.

C. Mathematical Note²² on the Derivation of Tables 2-5

Table 2

Let X_j be the total output of industry j excluding intra-industry consumption. Let x_{ij} be the output of industry i used by industry j . Then the input into industry j from industry i per dollar of total output of industry j is $\frac{x_{ij}}{X_j}$. Designate this expression by a_{ij} . For analytical purposes, where $i = j$, all x_{ij} are defined to be zero; hence, where $i = j$, all $a_{ij} = 0$.

Then the first forty-two rows of Table 2 form the 42×42 matrix of industry input coefficients, $A = [a_{ij}]$, where $i, j = (1, 2, 3 \dots 42)$, i indicating the row number and j the column number in Tables 1 and 2. The elements in the principal diagonal of this matrix are zero.

Let z_{kj} be the primary (or unallocated) input k used by industry j . Define $b_{kj} = \frac{z_{kj}}{X_j}$ to be the primary (or unallocated) input k into industry j per dollar of total output of industry j .

Then rows 43-46 and 48-51 of Table 2 form the 8×42 matrix of primary (and unallocated) input coefficients, $B = [b_{kj}]$, where $k = (43 \dots 46, 48 \dots 51)$, k indicating the row number in Tables 1 and 2.

For a particular input into a particular industry, the input coefficient is the ratio of the dollar value of the input calculated to the nearest hundred thousand dollars to the dollar value of the total output of the industry calculated to the nearest hundred thousand dollars, where possible. The figures in Table 2 cannot be precisely derived from Table 1 since the values of some primary inputs and of total industry outputs (inputs) excluding intra-industry consumption are shown only to the nearest million dollars in the latter table.

Table 3A

Table 3A is the 42×42 inverse matrix of the form $C = [c_{ij}] = [I - A]^{-1}$, where I is the identity matrix of the 42nd order²³.

²² For an explanation of the elements of matrix algebra and of the application of matrix algebra to input-output analysis, see Earl O. Heady and William Candler, *Linear Programming Methods*, (Ames, Iowa: Iowa State College Press, 1958), chapters 11 and 14. A discussion of computational problems is contained in two papers by W. Duane Evans: (i) "The Effect of Structural Matrix Errors on Interindustry Relations Estimates," *Econometrica*, XXII (Oct., 1954), 461-480 and (ii) "Input-Output Computations" in T. Barna (ed.), *The Structural Interdependence of the Economy* (New York: John Wiley & Sons, Inc., 1956), 53-102.

²³ Professor T.I. Matuszewski of the University of British Columbia has developed a method of calculating the inverse of a matrix of order $(n + 1)$ which does not involve any additional inversions once the inverse of order n is known. This method has been used by Matuszewski to enlarge the 42×42 matrix of Table 3A, which excludes unallocated input and output, to a 43×43 matrix which includes unallocated input and output.

Table 3B

Let $D = [d_{kj}]$ designate the 8×42 matrix contained in rows 43-46 and 48-51 of Table 3B. Then

$$D = [d_{kj}] = BC = [b_{kj}] [c_{ij}]$$

Hence the typical element of D , d_{kj} , is derived by the premultiplication of column vector j of C (Table 3A) by the row vector k of B (Table 2).

Table 4

Designate the 8×6 matrix contained in the first eight rows and the first six columns of Table 4 by E . Then

$$E = [e_{kr}] = DY = [d_{kj}] [y_{ir}]$$

where $Y = [y_{ir}]$ is the 42×6 matrix of unallocated and final output figures contained in rows 1-42 and columns 43 and 45-49 of Table 1; that is, $r = (43, 45 \dots 49)$ where r indicates the column number in Table 1. Therefore the typical element of E , e_{kr} , is derived by the premultiplication of the column vector r of Y (Table 1) by the row vector k of D (Table 3B).

The figures in Table 4 labelled "final primary and unallocated input content" are simultaneously both primary (or unallocated) inputs and final (or unallocated) outputs, but are not inputs into, or outputs of, any of the forty-two domestic industries. (Note that for analytical purposes, the unallocated row and column are not treated as an industry.) The figures are taken directly from Table 1, where they appear at the intersections of rows 43-46 and columns 43 and 45-50. These "final primary and unallocated inputs" must be added to the derived figures contained in the first eight rows of Table 4 in order to arrive at the total primary (and unallocated) input content of total final (and unallocated) output.

Table 5

Let F be the 42×6 matrix contained in the first forty-two rows and first six columns of Table 5.

$$\text{Then } F = [f_{ir}] = V_i C Y = V_i [c_{ij}] [y_{ir}]$$

where V_i is the gross domestic product input coefficient for industry i .

Hence f_{ir} , the typical element of F , is obtained by premultiplying column vector r of Y (Table 1) by row vector i of C (Table 3A) and then multiplying the resulting scalar by the gross domestic product input coefficient for industry i from row 52 of Table 2.

If the order of A is large, then C is usually derived using an electronic computer. Once C has been obtained, D , E and F can be derived in a reasonable length of time using a desk calculator.

III. EXPORTS AND IMPORTS IN RELATION TO DOMESTIC PRODUCTION

Tables 6 to 8 present commodity and geographic detail on the merchandise content of column 49 and row 44 of Table 1. Table 9 contains an alternative classification of merchandise imports which is similar to that used for inter-industry flow tables in some other countries.

In analyzing Canada's foreign trade in 1949 certain factors affecting this trade must be kept in mind. In November of 1947, to conserve the use of United States dollars, the Canadian government introduced the Emergency Exchange Conservation Act which had the effect of restricting imports from the United States and certain other countries not known to be short of United States dollars. This act prohibited the import of a variety of consumer goods and placed a variety of consumer goods under quota and, in addition, certain capital goods and production materials were admitted on a selective basis. During 1948 the number of items in these categories was increased but at the beginning of each quarter in 1949 some of the restrictions were relaxed. The easing of restrictions continued through 1950 and the last of the restrictions was removed on December 31, 1950.

During most of the first three quarters of 1949 the Canadian and United States dollars were at par. In September, however, a buying rate for United States dollars of \$1.10 was established and maintained for the balance of the year.

During 1949 an inventory adjustment occurred in the United States, but not in Canada. This resulted in a reduced volume of exports to the United States in the first three-quarters of the year but exports increased sharply in the fourth quarter. The devaluation of the Canadian dollar, as well as a recovery of United States demand, led to this fourth quarter increase. Imports into Canada from the United States were strong in the first part of 1949 because of the relaxation of some of the provisions of the Emergency Exchange Conservation Act and the sustained economic activity in Canada. Imports weakened in the latter part of the year, however, because of devaluation and because of steel and coal strikes in the United States. In so far as the use of imported goods was sustained through drawing on stockpiles (for example, coal), the import use figures in Tables 1, 7 and 8 do not fully reflect this decline in imports.

A. Merchandise Exports

The total estimate of merchandise exports which is used in the inter-industry study is the same total that appears in the balance of international payments plus gold production available for export. This total is different from that appearing in D.B.S. *Trade of Canada, year ending December 31, 1949*, Volumes I and II. The adjustments made for balance of payments purposes appear on page 71 of D.B.S., *The Canadian Balance of International Payments in Post-War Years, 1946-1952*. The total

exports of goods and services shown in Table 1 is the sum of the following items from the balance of payments:

Merchandise exports	\$2,989 million
Gold available for export	139
Total merchandise exports shown in Tables 6 and 8	3,128
Travel expenditures	285
Freight and shipping	303
All other current receipts	222
Total exports of goods and services in Table 1	\$3,938 million

Since the inter-industry flow table measures domestic product, interest and dividends received from abroad and inheritances and immigrants' funds are not included in the export of goods and services.

In Table 6 merchandise exports are classified according to the industry producing the goods and by the nine main commodity groups used for external trade statistics. Data on the commodity detail of merchandise exports are published in *Trade of Canada*, Volume II. By comparing export statistics with data on commodity production obtained from the D.B.S. Agriculture and Industry and Merchandising Divisions, it was possible to establish the industry producing the exported commodity. If the item was produced in two or more industries, the principal producer was assumed to have been the exporter. In cases, however, where there were two or more major producers the exports were prorated among them according to the value of production. The number of such cases was small since the choice of industry groups usually resulted in a particular commodity being produced in only one industrial group.

The export figures in *Trade of Canada* are valued f.o.b. point of shipment and this is the level of valuation shown in Tables 6 and 8. For Table 1, with two exceptions, it was assumed that this was equivalent to the value f.o.b. the producing establishment and no adjustment was made to arrive at producers' values. An adjustment was made to the value of exports of the agriculture industry and of the meat products industry to bring them to an estimated value f.o.b. the farm or f.o.b. the manufacturer. The total estimated spread between the two levels of valuation was shown in Table 1 as an export of the transportation, storage, and trade industry group.

For the inter-industry flow study, commodity detail from Newfoundland's balance of payments for the first quarter 1949 were incorporated. Exports to Newfoundland from Canada were excluded and the exports of Newfoundland to other countries included. This adjustment for Newfoundland exports was made because Canadian production statistics for 1949 generally included Newfoundland for the full twelve months. A reversing entry was made in the unallocated row to make the total add to the balance of payments total.

The industry of origin of a small amount of exports could not be determined and re-exports were not classified by commodity in Table 6 so that the total exports actually allocated by producing industry in this table were only \$3,091 million. The reversing entries for Newfoundland and for a small adjustment on re-exports were subtracted from the unallocated exports to arrive at the item "unallocated and adjustment" of \$4 million shown in Tables 6 and 8.

In Table 8 merchandise exports are classified according to the country to which they are consigned. The country of consignment is the country to which goods exported from Canada are intended to pass, without interruption of transit, except in the course of transshipment or transfer from one means of conveyance to another.

B. Exports of Services

The receipts of \$303 million from freight and shipping were shown as an export of the transportation, storage, and trade industry. Travel expenditure and all other current receipts were included in the unallocated row. An adjustment was made in the unallocated row for the use of imported supplies for foreign ships. This amount was deducted and added to re-exports.

C. Merchandise Imports

The total estimate of merchandise imports which is used in the inter-industry study is the same total that appears in the balance of international payments. The reconciliation of this total with that appearing in D.B.S. *Trade of Canada, year ending December 31, 1949* is on page 71 of D.B.S., *The Canadian Balance of International Payments in Post-War Years, 1946-1952*. The total imports of goods and services shown in Table 1 is the sum of the following items from the balance of payments:

Merchandise imports	\$2,696 million
Travel expenditures	193
Freight and shipping	253
Official contributions	6
All other current payments	315
Total imports of goods and services in Table 1	\$3,463 million

Since the inter-industry flow table measures domestic product, interest and dividends paid abroad and inheritances and emigrants' funds are not included in imports of goods and services.

In Table 7, merchandise imports are classified according to the industry using the imported good and by the nine main commodity groups used for external trade statistics. In this table and in Table 8, imports are valued f.o.b. point of shipment (the level of valuation appearing in *Trade of Canada*). For the inter-industry flow table (Table 1), freight and shipping amounting to \$240 million were added to raise the level of valuation to c.i.f. Canadian border.

Data on the individual commodities imported are published in *Trade of Canada, 1949*, Volume III. In the commodity detail used for the inter-industry study, commodities imported by Newfoundland during the first quarter of 1949 were included and imports into Newfoundland from Canada during the same period were excluded. A reversing entry was made in the unallocated column of the table to make the total add to the control total derived from the balance of payments. This adjustment for Newfoundland was made because Canadian production figures generally included Newfoundland for all of 1949.

The method of estimating imports used by an industry was an integral part of the estimation of the source of all materials and services obtained either from other Canadian industries or from other countries. This method is described in Part IV.B.

In Table 8, imports into Canada are classified according to the countries whence they were consigned to Canada. The countries of consignment are the countries from which the goods have come, without interruption of transit, except in the course of transshipment or transfer from one conveyance to another. The countries whence goods are consigned are not necessarily the countries of actual origin, since goods produced in one country may be purchased by a firm in another country and thence despatched, after a longer or shorter interval, to Canada. In such cases the second country would be the country of consignment to which the goods would be credited. An example is the case of tea grown in the Orient but purchased in the bonded market in London, England; Canadian statistics record such imports as coming from the United Kingdom.

Table 9 shows an alternative classification of import data in which imports are classified according to whether similar goods are produced in Canada and according to the industry producing the goods. Imports are included in part B of this table on the basis of three types of consideration: (i) imports designated in the Canadian customs tariff as of a "class or kind not made in Canada," (ii) imports of commodities not produced in Canada as far as can be determined from D.B.S. statistics of commodity production, and (iii) an assumed share of n.o.p. (not otherwise provided for) items in external trade statistics which definitely contain some items not produced in Canada (e.g. vegetable products, n.o.p.). In deciding whether or not a commodity is produced in Canada, the nature of the productive process was taken into consideration but not the possibility of substitution by the consumer. For example, whisky and wine are produced in Canada by basically similar processes as used abroad and using the same kind of materials; they were therefore included in part A of Table 9. On the other hand, rum, produced from sugar cane, was included in part B. Oranges were treated as a commodity not produced in Canada even though they might be considered to be substitutable in consumption for domestically-produced fruits. In some cases, it is difficult from the available statistics to determine

whether or not a particular commodity is produced in Canada. For example, some sizes of structural steel are not manufactured in Canada and imports of these should be included in part B of the table. The available import and production statistics for 1949 did not, however, distinguish the type or size of these commodities in sufficient detail to enable such comparisons to be made.

D. Imports of Services

The cost of moving imported goods from the port of shipment to the Canadian border was estimated to be \$240 million, including freight on goods transported by Canadian carriers. The \$240 million was added to the value of the merchandise in the entries into Table 1 and is therefore distributed over all using industries and final output categories. Thirteen million dollars in payments for

freight and shipping is included in the unallocated imports. This is the sum of Canadian shipping expenditures abroad and time charters included in the balance of payments less the freight to the border on imports transported by Canadian carriers.

Ten per cent of the \$193 million in travel expenditure was assumed to be for business purposes and included with other unallocated imports. The remainder was treated as personal expenditure and included in column 45.

Of the \$315 million in all other current payments, \$44 million was estimated to be personal expenditure on consumer goods and services. The remaining all other current payments, official contributions, and a reversing entry necessary to offset the addition made to the official estimate of re-exports, were included in unallocated imports.

TABLE 6. Merchandise Exports¹ by Producing Industry and by Main Commodity Groups, 1949

No.		Agricultural and vegetable products	Animal and animal products	Fibres, textiles and textile products	Wood, wood products and paper	Iron and its products	Non-ferrous metals and their products	Non-metallic minerals and their products	Chemicals and allied products	Miscellaneous commodities	Total merchandise exports
		millions of dollars									
1	Agriculture	555.2	93.8	1.8	--	--	--	--	--	--	650.8
2	Forestry	--	--	--	51.2	--	--	--	--	--	51.2
3	Fishing, hunting and trapping	--	45.3	--	--	--	--	--	--	--	45.3
4	Metal mining and smelting and refining	--	--	--	--	14.1	527.4 ²	--	1.0	--	542.6
5	Coal mining, crude petroleum and natural gas	--	--	--	--	--	--	3.2	--	--	3.2
6	Non-metal mining, quarrying, and prospecting	--	--	--	--	--	--	41.8	--	--	41.8
7	Meat products	0.2	86.5	--	--	--	--	--	--	--	86.7
8	Dairy products	--	29.9	--	--	--	--	--	--	--	29.9
9	Fish processing	--	72.6	--	--	--	--	--	--	--	72.6
10	Fruit and vegetable preparations	7.0	--	--	--	--	--	--	--	--	7.0
11	Grain mill products	105.7	--	--	--	--	--	--	--	--	105.7
12	Bakery products	0.2	--	--	--	--	--	--	--	--	0.2
13	Carbonated beverages	--	--	--	--	--	--	--	--	--	--
14	Alcoholic beverages	34.5	--	--	--	--	--	--	0.3	--	34.9
15	Confectionery and sugar refining	1.1	--	--	--	--	--	--	--	--	1.1
16	Miscellaneous food preparations	12.2	5.0	--	--	--	--	--	--	--	17.2
17	Tobacco and tobacco products	8.8	--	--	--	--	--	--	--	--	8.8
18	Rubber products	12.3	--	--	--	--	--	--	--	--	12.3
19	Leather products	0.1	7.1	--	--	--	--	--	--	0.1	7.4
20	Textile products (except clothing)	--	--	18.8	--	--	--	--	--	--	18.8
21	Clothing (textile and fur)	--	0.8	3.8	--	--	--	--	--	--	4.5
22	Furniture	--	--	--	0.3	0.1	--	--	--	0.1	0.5
23	Wood products (except furniture)	--	--	--	197.4	--	--	--	--	0.2	197.6
24	Paper products	--	--	--	628.9	--	--	--	--	--	628.9
25	Printing, publishing, and allied industries ..	--	--	--	3.7	--	0.1	--	--	--	3.7
26	Primary iron and steel	--	--	--	--	39.2	--	1.2	--	--	40.4
27	Agricultural implements	--	--	--	--	93.4	--	--	--	--	93.4
28	Iron and steel products, n.e.s.	--	--	--	--	47.4	0.3	--	--	0.1	47.8
29	Transportation equipment	--	--	--	--	85.7	0.5	--	--	68.6	154.9
30	Jewellery and silverware (incl. watch repair) ..	--	--	--	--	--	2.8	--	--	0.1	2.8
31	Non-ferrous metal products, n.e.s.	--	--	--	--	0.7	23.4	--	--	--	24.2
32	Electrical apparatus and supplies	--	--	--	--	2.4	11.5	--	--	1.4	15.3
33	Non-metallic mineral products	2.6	--	--	--	0.1	--	17.7	--	--	20.4
34	Products of petroleum and coal	--	--	--	--	--	--	7.6	--	--	7.6
35	Chemicals and allied products	26.9	0.2	--	--	--	--	--	68.5	--	95.6
36	Miscellaneous manufacturing industries	--	--	--	--	3.2	0.6	0.6	0.3	5.0	9.7
37	Construction	--	--	--	--	--	--	--	--	--	--
38	Transportation, storage, and trade	0.1	--	--	--	--	--	--	--	--	0.1
39	Communication	--	--	--	--	--	--	--	--	--	--
40	Electric power, gas, and water utilities	--	--	--	--	--	--	--	--	4.8	4.8
41	Finance, insurance, and real estate	--	--	--	--	--	--	--	--	--	--
42	Service industries	--	--	--	--	--	--	--	--	1.7	1.7
	Total	766.9	341.2	24.4	881.5	286.5	566.5	72.0	70.3	82.2	3,091.5
	Re-exports										32.8
	Unallocated and adjustment										4
	Total merchandise exports										3,128

¹ Basis of valuation is f.o.b. point of shipment for export. Some adjustments have been made to the figures published in *Trade of Canada*. See page 19 for an explanation.

² This figure includes gold available for export.

TABLE 7. Merchandise Imports¹ by Using Industry and by Main Commodity Groups, 1949

No.		Agricultural and vegetable products	Animal and animal products	Fibres, textiles and textile products	Wood, wood products and paper	Iron and its products	Non-ferrous metals and their products	Non-metallic minerals and their products	Chemicals and allied products	Miscellaneous commodities	Total merchandise imports
		millions of dollars									
1	Agriculture	3.4	1.1	0.1	--	12.2	--	1.5	5.8	--	24.2
2	Forestry	--	--	--	--	0.4	--	--	--	--	0.4
3	Fishing, hunting and trapping	--	--	0.7	--	0.2	0.1	0.6	--	--	1.6
4	Metal mining and smelting and refining	0.5	--	0.1	--	1.0	15.2	14.5	3.4	--	34.7
5	Coal mining, crude petroleum and natural gas	--	--	0.1	--	0.3	0.1	--	0.1	--	0.6
6	Non-metal mining, quarrying, and prospecting	--	--	--	--	0.2	--	0.1	--	--	0.2
7	Meat products	11.6	2.2	--	0.2	--	--	0.5	1.9	--	16.4
8	Dairy products	0.5	0.1	0.1	0.4	0.3	--	1.5	0.3	--	3.1
9	Fish processing	0.5	0.7	--	0.3	0.3	--	--	0.1	--	1.9
10	Fruit and vegetable preparations	3.4	0.3	--	--	0.6	--	0.7	0.2	--	5.2
11	Grain mill products	10.3	0.1	0.9	0.2	0.3	--	0.8	0.4	0.3	13.3
12	Bakery products	4.6	1.3	--	0.3	0.3	--	0.5	0.4	--	7.5
13	Carbonated beverages	1.4	--	--	0.3	0.5	0.1	0.8	0.4	--	3.4
14	Alcoholic beverages	8.8	0.1	--	0.4	--	--	2.1	1.4	--	12.7
15	Confectionery and sugar refining	81.2	0.4	0.2	0.3	0.1	--	0.8	0.2	--	83.1
16	Miscellaneous food preparations	69.7	1.0	--	--	--	--	0.9	1.1	--	72.8
17	Tobacco and tobacco products	3.1	--	--	0.6	0.3	0.1	0.1	0.4	--	4.6
18	Rubber products	18.0	0.3	3.5	0.2	0.3	1.1	1.0	5.7	--	30.0
19	Leather products	0.3	19.4	0.2	0.6	0.3	0.2	0.5	4.6	0.5	26.6
20	Textile products (except clothing)	1.8	1.6	156.9	2.3	2.7	--	2.6	12.3	0.1	180.4
21	Clothing (textile and fur)	0.1	17.7	106.8	0.2	0.4	1.0	0.5	0.8	1.6	129.3
22	Furniture	0.2	0.2	2.5	3.4	1.5	1.1	0.8	1.3	--	10.9
23	Wood products (except furniture)	--	--	--	7.4	1.4	0.2	1.4	0.6	--	11.0
24	Paper products	1.2	--	2.6	6.6	1.0	0.1	20.9	4.5	--	36.9
25	Printing, publishing, and allied industries ..	--	--	0.1	3.4	1.1	2.0	0.2	0.6	--	7.4
26	Primary iron and steel	--	--	--	--	27.7	11.4	4.2	0.4	--	43.8
27	Agricultural implements	0.2	--	--	0.4	14.9	0.9	0.6	0.3	0.1	17.5
28	Iron and steel products, n.e.s.	0.7	--	--	2.5	73.3	3.7	4.5	2.0	0.5	87.1
29	Transportation equipment	0.8	0.2	0.1	0.5	173.6	9.3	4.2	0.2	3.3	192.2
30	Jewellery and silverware (incl. watch repair) ..	--	--	--	--	0.1	4.3	2.3	0.1	0.7	7.4
31	Non-ferrous metal products, n.e.s.	--	--	--	0.1	2.8	7.2	0.3	--	--	10.5
32	Electrical apparatus and supplies	0.7	--	0.5	1.4	22.9	18.9	6.4	2.4	8.2	61.3
33	Non-metallic mineral products	0.1	--	0.1	1.3	--	1.8	15.3	1.4	0.8	20.8
34	Products of petroleum and coal	--	--	--	--	0.5	0.1	215.5	9.1	--	225.1
35	Chemicals and allied products	22.1	3.6	0.3	1.5	1.0	0.8	17.3	46.1	2.3	95.0
36	Miscellaneous manufacturing industries	1.1	2.3	1.4	1.5	1.9	2.9	2.6	5.4	2.8	21.9
37	Construction	2.4	--	2.9	8.5	54.1	7.5	27.8	0.1	0.2	103.5
38	Transportation, storage, and trade	--	--	--	0.7	24.2	3.7	61.3	--	6.1	96.0
39	Communication	--	--	--	0.3	--	--	--	--	--	0.3
40	Electric power, gas, and water utilities	--	--	--	--	--	--	2.4	--	0.7	3.1
41	Finance, insurance, and real estate	--	--	--	0.6	--	--	--	--	--	0.6
42	Service industries	0.2	0.1	3.1	9.8	4.9	2.2	24.2	2.8	11.6	58.9
	Personal expenditure on consumer goods	124.8	16.9	38.3	25.6	61.2	18.8	91.1	11.1	31.0	418.8
	Government expenditure on goods	--	--	--	--	--	--	--	--	--	--
	Business gross fixed capital formation	1.0	2.2	3.1	--	401.3	48.6	0.2	--	23.0	479.4
	Re-exports	1.3	1.4	3.8	0.7	9.3	1.6	7.9	1.3	5.5	32.8
	Total	375.8	73.3	328.4	82.4	899.5	165.1	541.2	129.1	99.4	2,694.2
	Value of physical change in inventories										-13
	Unallocated and adjustment										15
	Total merchandise imports										2,696

¹ Basis of valuation is f.o.b. point of shipment in the country of export. Some adjustments have been made to the figures published in *Trade of Canada*. See page 20 for an explanation.

TABLE 8. Merchandise Imports¹ by Using Industry and by Country of Origin, and Merchandise Exports² by Producing Industry and by Country of Destination, 1949

No.		Imports				Exports			
		United Kingdom	United States	Other Countries	Total	United Kingdom	United States	Other Countries	Total
		millions of dollars							
1	Agriculture	1.1	22.4	0.7	24.2	294.0	187.6	169.2	650.8
2	Forestry	--	0.4	--	0.4	11.4	39.1	0.7	51.2
3	Fishing, hunting and trapping	0.5	0.4	0.7	1.6	3.3	27.9	14.1	45.3
4	Metal mining and smelting and refining	1.4	21.7	11.6	34.7	145.2	337.6	59.8	542.6
5	Coal mining, crude petroleum and natural gas	0.2	0.4	0.1	0.6	--	--	3.2	3.2
6	Non-metal mining, quarrying, and prospecting	--	0.2	--	0.2	2.9	35.0	3.9	41.8
7	Meat products	0.4	13.6	2.4	16.4	24.8	42.9	19.0	86.7
8	Dairy products	0.1	2.8	0.2	3.1	15.2	2.0	12.7	29.9
9	Fish processing	--	1.7	0.2	1.9	8.1	50.8	13.7	72.6
10	Fruit and vegetable preparations	0.1	2.9	2.2	5.2	0.9	1.3	4.8	7.0
11	Grain mill products	0.1	12.8	0.4	13.3	47.2	5.8	52.7	105.7
12	Bakery products	0.5	4.3	2.7	7.5	--	0.2	--	0.2
13	Carbonated beverages	0.3	3.1	--	3.4	--	--	--	--
14	Alcoholic beverages	1.7	8.8	2.2	12.7	0.7	29.7	4.5	34.9
15	Confectionery and sugar refining	1.6	4.5	77.0	83.1	--	0.9	0.2	1.1
16	Miscellaneous food preparations	0.9	17.6	54.3	72.8	4.9	9.3	3.0	17.2
17	Tobacco and tobacco products	0.2	2.5	1.9	4.6	7.3	--	1.5	8.8
18	Rubber products	0.6	17.1	12.3	30.0	0.9	4.6	6.8	12.3
19	Leather products	3.4	18.9	4.3	26.6	1.1	3.1	3.2	7.4
20	Textile products (except clothing)	32.5	94.0	53.9	180.4	0.3	8.1	10.4	18.8
21	Clothing (textile and fur)	55.2	56.2	17.9	129.3	0.2	2.7	1.6	4.5
22	Furniture	0.8	9.5	0.6	10.9	--	0.2	0.3	0.5
23	Wood products (except furniture)	0.4	10.5	0.1	11.0	41.8	126.8	29.0	197.6
24	Paper products	0.8	35.7	0.4	36.9	33.4	544.9	50.6	628.9
25	Printing, publishing, and allied industries ..	0.4	7.0	--	7.4	0.1	2.6	1.0	3.7
26	Primary iron and steel	0.6	32.3	10.9	43.8	11.7	15.5	13.2	40.4
27	Agricultural implements	0.4	16.9	0.2	17.5	4.1	70.9	18.4	93.4
28	Iron and steel products, n.e.s.	3.8	78.3	5.0	87.1	1.3	10.8	35.7	47.8
29	Transportation equipment	14.0	176.6	1.6	192.2	19.2	5.1	130.6	154.9
30	Jewellery and silverware (incl. watch repair) ..	1.3	3.6	2.5	7.4	0.3	2.1	0.4	2.8
31	Non-ferrous metal products, n.e.s.	1.3	6.2	3.0	10.5	6.7	5.5	12.0	24.2
32	Electrical apparatus and supplies	3.4	55.8	2.1	61.3	0.4	1.2	13.7	15.3
33	Non-metallic mineral products	2.0	15.8	3.0	20.8	3.7	10.7	6.0	20.4
34	Products of petroleum and coal	0.1	115.9	109.1	225.1	0.4	6.6	0.6	7.6
35	Chemicals and allied products	3.4	77.7	13.8	94.9	4.5	41.5	49.6	95.6
36	Miscellaneous manufacturing industries	1.9	18.8	1.2	21.9	1.9	1.6	6.2	9.7
37	Construction	11.6	88.6	3.3	103.5	--	--	--	--
38	Transportation, storage, and trade	6.2	85.9	3.9	96.0	--	0.1	--	0.1
39	Communication	--	0.3	--	0.3	--	--	--	--
40	Electric power, gas, and water utilities	--	3.1	--	3.1	--	4.8	--	4.8
41	Finance, insurance, and real estate	0.1	0.5	--	0.6	--	--	--	--
42	Service industries	12.7	43.7	2.5	58.9	--	0.3	1.4	1.7
	Personal expenditure on consumer goods	88.7	254.8	75.3	418.8	--	--	--	--
	Government expenditure on goods	--	--	--	--	--	--	--	--
	Business gross fixed capital formation	30.2	444.5	4.7	479.4	--	--	--	--
	Re-exports	5.7	24.4	2.7	32.8	4.3	20.6	7.9	32.8
	Total	290.6	1,912.8	490.8	2,694.2	702.2	1,660.4	761.6	3,124.3
	Value of physical change in inventories				-13				--
	Unallocated and adjustment				15				4
	Total merchandise imports or exports				2,696				3,128

¹ Basis of valuation is f.o.b. point of shipment in the country of export.

² Basis of valuation is f.o.b. point of shipment for export.

Note: Some adjustments have been made to the figures published in *Trade of Canada*. See pages 19 and 20 for an explanation.

TABLE 9. Merchandise Imports¹ Classified According to Whether Similar Goods are Produced in Canada and According to the Domestic Industry Producing the Goods, 1949
(millions of dollars)

A. Imports classified according to the domestic industry producing similar goods			A. Imports classified according to the domestic industry producing similar goods		
No.			No.		
1	Agriculture	76.6	31	Non-ferrous metal products, n.e.s.	20.6
2	Forestry	0.4	32	Electrical apparatus and supplies	76.2
3	Fishing, hunting and trapping	5.8	33	Non-metallic mineral products	66.6
4	Metal mining and smelting and refining	17.8	34	Products of petroleum and coal	102.2
5	Coal mining, crude petroleum and natural gas	282.9	35	Chemicals and allied products	86.2
6	Non-metal mining, quarrying, and prospecting	5.1	36	Miscellaneous manufacturing industries	50.5
7	Meat products	25.7	37	Construction	1.8
8	Dairy products	2.5	38	Transportation, storage, and trade	--
9	Fish processing	4.0	39	Communication	--
10	Fruit and vegetable preparations	9.6	40	Electric power, gas, and water utilities	1.2
11	Grain mill products	0.8	41	Finance, insurance, and real estate	--
12	Bakery products	1.2	42	Service industries	3.8
13	Carbonated beverages	0.1			
14	Alcoholic beverages	15.8		<i>Sub-total</i>	<i>1,986.2</i>
15	Confectionery and sugar refining	5.7			
16	Miscellaneous food preparations	4.3		B. Estimated imports of items not produced in Canada	
17	Tobacco and tobacco products	1.0		Agricultural and vegetable products	260.0
18	Rubber products	14.3		Animal and animal products	12.4
19	Leather products	10.8		Fibres, textiles and textile products	95.1
20	Textile products (except clothing)	209.6		Wood, wood products and paper	8.4
21	Clothing (textile and fur)	18.2		Iron and its products	121.0
22	Furniture	2.4		Non-ferrous metals and their products	36.1
23	Wood products (except furniture)	16.4		Non-metallic minerals and their products	77.7
24	Paper products	23.8		Chemicals and allied products	54.4
25	Printing, publishing, and allied industries	31.0		Miscellaneous commodities	18.1
26	Primary iron and steel	107.0		<i>Sub-total</i>	<i>683.2</i>
27	Agricultural implements	168.3			
28	Iron and steel products, n.e.s.	296.6		<i>Total</i>	<i>2,669.4</i>
29	Transportation equipment	201.2		<i>Unallocated and adjustment</i>	<i>27</i>
30	Jewellery and silverware (incl. watch repair)	18.1		<i>Total merchandise imports</i>	<i>2,696</i>

1. Basis of valuation is f.o.b. point of shipment in the country of export. Some adjustments have been made to the figures published in *Trade of Canada*. See page 20 for an explanation.

IV. NOTES ON CLASSIFICATION, SOURCES, AND METHODS

Since the inter-industry flow table is an extension of the National Accounts, the concepts, sources, and methods for those Accounts also apply to this table. These have not been repeated and the reader is referred to D.B.S., *National Accounts, Income and Expenditure, 1926-1956*, (Ottawa, 1958), Parts II and III for a fuller description. (In these notes this publication will be referred to as the *National Accounts*.)

The work of assembling the 1949 table of the inter-industry flow of goods and services was divided into four parts: (i) definition and measurement of the output of the forty-two industries in the table (the first forty-two totals in the right hand column and in row 53 of Table 1), (ii) estimation of the allocation of the inputs into each industry by industrial or imported source (the first forty-six figures in each of

the first forty-two columns of the table), (iii) estimation of the distribution of final output by industrial sources (the figures in columns 45 to 49), and (iv) the estimation of the distribution of gross domestic product of each industry (the figures in rows 48 to 51 of the first 42 columns). Although these parts of the work were interrelated, as far as possible the estimation of each part proceeded independently. Once estimates of total output, inter-industry and imported input, final output, and gross domestic product were made, all cells in the table (except the unallocated column) were filled in; that is, the table was assembled by filling in the figures for each column in the table. The consistency of the disposition of output figures (including the residual unallocated output) obtained by this method was then examined and changes made in input figures until the table balanced.

TABLE 10. Industrial Classification For the 1949 Table of Inter-Industry Flow of Goods and Services

	D.B.S. Standard Industrial Classification Code No. (1948 Manual)
1. Agriculture	000- 079
2. Forestry	080- 089
3. Fishing, hunting and trapping	091- 097
4. Metal mining and smelting and refining	101- 119, 345
5. Coal mining, crude petroleum and natural gas	121- 126
6. Non-metal mining, quarrying, and prospecting	131- 133, 139- 179
7. Meat products	200
8. Dairy products	201- 209
9. Fish processing	210
10. Fruit and vegetable preparations	212
11. Grain mill products	213- 216
12. Bakery products	218- 219
13. Carbonated beverages	220
14. Alcoholic beverages	221- 224
15. Confectionery and sugar refining	225, 227
16. Miscellaneous food preparations	228
17. Tobacco and tobacco products	230
18. Rubber products	236, 239
19. Leather products	241- 249
20. Textile products (exc. clothing)	251- 269
21. Clothing (textile and fur)	270- 279
22. Furniture	286
23. Wood products (exc. furniture)	281- 285, 287- 289
24. Paper products	292- 299
25. Printing, publishing and allied industries	301- 309
26. Primary iron and steel	325
27. Agricultural implements	311
28. Iron and steel products, n.e.s.	312- 324, 326- 329
29. Transportation equipment	330- 339
30. Jewellery and silverware (incl. watch repair)	343, 346
31. Non-ferrous metal products, n.e.s.	341, 342, 347, 349
32. Electrical apparatus and supplies	351- 359
33. Non-metallic mineral products	137, 361- 369
34. Products of petroleum and coal	373- 379
35. Chemicals and allied products	380- 389
36. Miscellaneous manufacturing industries	391- 399
37. Construction ¹	404- 439
38. Transportation, storage, and trade	501- 527, 701- 799
39. Communication	543- 549, 914
40. Electric power, gas, and water utilities	602- 609
41. Finance, insurance, and real estate ²	802- 809
42. Service industries ³	901- 911, 916- 949

¹ The construction industry includes all new and repair construction activity, including construction put in place by the labour force of other industries.

² The real estate industry includes all residential property, owned or rented, and all rented non-residential property.

³ The community, recreation, personal, and business service industries and the public administration and defence industry are included in this industry group.

A. Definition and Measurement of Industry Output

The industries in the table, with certain modifications which are explained below, are aggregations of industries defined in the D.B.S. *Standard Industrial Classification Manual* (1948 edition). Table 10 shows the groupings used. Table 11 reconciles the total output figures published by other D.B.S. Divisions with the figures used in the inter-industry table.

1. Agriculture

Agricultural output is measured by the gross income from farming operations accruing to farm operators. Farming operations are defined to include the sale of logs cut from forests on farm property and the income from fur farming. The components of gross farm income are (i) accrued income from the sale of farm products (excluding sales to farmers within the same province), (ii) income in kind, and (iii) the value of the physical change in inventories of live stock and grain on farms and grain in the Wheat Board or other commercial channels.

As estimate for gross income of farm operators from farming operations for 1949, \$2,631 million, was obtained from D.B.S. Reference Paper 25, *Handbook of Agricultural Statistics*, Part II (revised). To this was added an estimate of \$4 million for gross income of Newfoundland. For the inter-industry study, all rental activity was classified in the real estate industry so that the amount of house rent, \$93 million, was deducted from farm income and included as real estate industry income. To conform with the definition of accrued net income of farm operators from farm production used in the *National Accounts* an adjustment on grain transactions was made. The adjustment for grain transactions, a deduction of \$111 million, takes account of the undistributed earnings (net of adjustment payments) of the Canadian Wheat Board and also adjusts for the fact that current earnings of this agency are calculated on the basis of the change in book values of inventories, whereas the required valuation of inventories is the value of physical change. An adjustment of \$18 million was made to exclude from the value of output transfer payments under the Prairie Farm Income Plan and the Prairie Farm Assistance Act. An adjustment to the value of inventory change of \$11 million was made since the National Accounts values the quarterly inventory change at average quarterly prices whereas the Agriculture Division values the annual change in farm inventories at average annual prices. (See Table 52 of the *National Accounts*.) Thus the total output of agriculture at producers' price was estimated to be \$2,402 million.

2. Forestry

The output of the forestry industry is defined to include all forest products (sawlogs, pulpwood, fuelwood, poles, and so forth) cut in Canadian forests during the year. From D.B.S. *Operations in the Woods: Revised Estimates of Forest Production*,

1940-1953 was obtained an estimate of \$492 million. To arrive at the value of forest production it was necessary to subtract the value of forest products included in farm income. This figure is also given in this publication and amounted to \$60 million.

3. Fishing, Hunting and Trapping

(a) Fishing

From D.B.S. *Fisheries Statistics of Canada, 1949 and 1950* the figure for total unduplicated value of fishery products marketed was obtained. To this was added an estimate of Newfoundland production for 1949. From this total the estimate for the production of the fish processing industry was subtracted, and the fish processing industry's use of fish produced by the primary fishing industry at producers' prices added, to arrive at the total output of the primary fishing industry.

(b) Hunting and trapping

The D.B.S. report *Fur Production* gives the value of fur pelts obtained from wild life. This report is published for the fur season, a negligible adjustment was made to convert these figures to a calendar year estimate.

4. Mining, Quarrying, and Oil Wells

The D.B.S. publication *General Review of the Mining Industry, 1949* contains figures for the gross value of production of industries in this group. Special treatment was adopted in the following cases:

(a) Metal mining and smelting and refining

Because of the integrated nature of some companies in the metal mining and smelting and refining industries, it was not possible to separate manufacturing from mining operations for the inter-industry flow study. The value of output of this combined industry group was estimated by adding together: (i) the value added in the metal mining, smelting and refining, and contract drilling industries as published in the *General Review of the Mining Industry, 1949* and in *Contract Drilling in the Mining Industry, 1949*, plus (ii) the cost of fuel and electricity used in this industry as published in the reports for the individual industries in this group, plus (iii) the cost of process supplies and materials used (including imported ores and concentrates) as published in the reports for these industries after adjusting for any duplication between costs reported for the nickel-copper industry and the smelting and refining industry and after deducting an estimate of the value of products of this combined metal mining and smelting and refining industry group used by other establishments in the group. (Transportation, storage, and trade margins on this intra-industry consumption was included in the cost of materials.) The value of output obtained by this method excluded all intra-industry consumption.

TABLE 11. Reconciliation of Industry Output Totals in Table 1 with those in other DBS Publications

No.	Industry	Source of figures in column 2	Total output figure in other DBS publications	Adjustment for classification differences and other discrepancies	Adjustment for inventory change	Output of repair establishments	New-foundland adjustment	Total output at producers' prices in Table 1
		1	2	3	4	5	6	7
			millions of dollars					
1	Agriculture	A	2,631	-222	-11	...	4	2,402
2	Forestry	B	492	- 60	...	...	...	432
3	Fishing, hunting and trapping	C, D	148	- 63	...	...	33	118
4	Metal mining and smelting and refining	¹	...	...	...	...	...	644
5	Coal mining, crude petroleum and natural gas ..	E	190	- 14	...	...	...	176
6	Non-metal mining, quarrying, and prospecting ..	E	110	- 11	...	...	...	98
7	Meat products	F	711	...	- 5	...	...	706
8	Dairy products	F	441	- 1	- 1	...	...	439
9	Fish processing	F	112	2	...	...	11	125
10	Fruit and vegetable preparations	F	149	...	- 2	...	...	147
11	Grain mill products	F	464	- 32	- 2	...	...	429
12	Bakery products	F	263	...	...	...	...	263
13	Carbonated beverages	F	86	...	...	...	...	86
14	Alcoholic beverages	F	228	...	...	...	...	228
15	Confectionery and sugar refining	F	216	...	- 1	...	...	215
16	Miscellaneous food preparations	F	213	1	...	...	...	214
17	Tobacco and tobacco products	F	172	...	--	...	...	173
18	Rubber products	F	178	...	...	...	...	178
19	Leather products	F	211	...	...	19	...	230
20	Textile products (except clothing)	F	637	...	2	...	...	638
21	Clothing (textile and fur)	F	728	...	- 9	38	...	756
22	Furniture	F	157	...	1	7	...	165
23	Wood products (except furniture)	F	683	-47	- 6	...	...	630
24	Paper products	F	1,093	...	- 2	...	...	1,091
25	Printing, publishing, and allied industries	F	378	...	- 2	...	...	376
26	Primary iron and steel	F	306	17	- 1	...	...	321
27	Agricultural implements	F	177	...	- 2	...	...	175
28	Iron and steel products, n.e.s.	F	936	...	-14	12	...	934
29	Transportation equipment	F	1,063	...	-28	100	...	1,135
30	Jewellery and silverware (incl. watch repair) ..	F	51	...	...	3	...	54
31	Non-ferrous metal products, n.e.s.	F	217	...	- 2	...	...	215
32	Electrical apparatus and supplies	F	486	...	-14	12	...	484
33	Non-metallic mineral products	F	246	...	1	...	...	247
34	Products of petroleum and coal	F	534	24	- 2	...	...	556
35	Chemicals and allied products	F	587	1	2	...	...	590
36	Miscellaneous manufacturing industries	F	156	...	- 2	19	...	173
37	Construction	G	²	...	...	...	...	2,979
38	Transportation, storage, and trade		¹	...	...	...	...	4,477
39	Communication		¹	...	...	...	...	327
40	Electric power, gas, and water utilities		¹	...	...	...	...	489
41	Finance, insurance, and real estate		¹	...	...	...	...	2,119
42	Service industries		¹	...	...	...	...	3,545

¹ No comparable figure is published by DBS.

² The published figure of \$2,931 million contains a revision made after the completion of the inter-industry flow table.

Note: Components may not add exactly to totals because of rounding.

Sources: A DBS Publication 21-502, *Handbook of Agricultural Statistics, Part II, Farm Income, 1926-57*, p. 26.

B DBS Publication 25-501, *Operations in the Woods: Revised Estimates of Forest Production, 1940-1953 and Final Estimates, 1954-55*, p. 71.

C DBS Publication 24-201, *Fisheries Statistics of Canada, 1949 and 1950*, p. 11.

D DBS Publication 23-207, *Fur Production, Season 1948-1949*, p. 3 and *Season 1949-1950*, p. 3.

E DBS Publication 26-201, *General Review of the Mining Industry, 1949*, pp. 34-37.

F DBS Publication 31-201, *General Review of the Manufacturing Industries, 1949*, pp. 16-23.

G DBS Publication 61-504, *Private and Public Investment in Canada, 1946-1957*, p. 12.

(b) Crude petroleum and natural gas

The value of production of natural gas was taken as the value at the well-head of gas produced by establishments principally engaged in the production, not the distribution, of natural gas.

(c) Non-metal mining, quarrying, and prospecting

The Census of Industry figure is for gross value of shipments and an adjustment for the change in inventories of finished products should have been made but the figure was not available. Freight charges were included in the gross value of shipments and an adjustment was made to exclude these. A deduction was made from the gross value of production of the non-metal mining industry to exclude output also included in the sand and gravel industry.

An estimate of the net income originating in the prospecting industry was used as the gross value of production of the industry. The gross value of production of the quarrying and sand pit industries was reduced by an adjustment to eliminate the value of products quarried for own consumption by governments and railways since the inputs relating to these activities are not separated from those relating to activities classified in other industries.

5. Manufacturing

The D.B.S. Census of Industry is a census of manufactured products. The definition of gross value of production is therefore the sum of the value of products made by establishments classified to an industry in 1949. The Census schedule defined the value of products made in 1949 as follows:

"Products made: Give the quantities and selling values, at the works, of all products made during the year, whether sold or not, and whether made for sale in Canada or for export. Do not include sales tax or other excise duties. Do not include resale of goods which were not produced in this establishment."

For the inter-industry flow table it was necessary to define the gross value of production to include the change in goods in process, since on the input side all materials and services used during the year are included. For the value of output to be identical with the value of input, the change in goods in process must therefore be taken into account. Estimates of the change in goods in process of each industry were obtained from the worksheets of the National Income Section and added to the Census gross value of production figure.

Another difference from the Census of Industry figures is that in accordance with the Standard Industrial Classification, repair establishments were classified as manufacturing. The data on manufacturing are collected annually by the Census of Industry and the principal statistics for 1949 for each industry are published in the D.B.S., *General Review of Manufacturing Industries of Canada, 1949*. Data on repair establishments are collected

decennially and data for 1951 are published in *Census of Canada, 1951*, Volume VII, "Distribution-Retail Trade." These figures were projected back to 1949 on the basis of indicators used for the *National Accounts*. (See p. 160 of the *National Accounts*.)

Repair and similar type establishments covered by the decennial census and classified by the Standard Industrial Classification to manufacturing are included in the following industry groups:

Industry Group	Principal activity of establishment
Leather products	Shoe repair, harness repair
Clothing	Custom tailoring, dressmaking, and shirtmaking
Furniture	Upholstery and furniture repair
Iron and steel products, n.e.s.	Blacksmiths, horseshoe shops, locksmiths, gunsmiths, and machine shops with gross value of production of less than five thousand dollars
Transportation equipment	Bicycle and motorcycle repair, automobile service garages, battery ignition and electrical repair, body repair and paint shops, tire and brake shops, washing and polishing, and other automotive service
Jewellery and silverware	Watch, clock and jewellery repair; jewellery engraving
Electrical apparatus and supplies	Armature rewinding, radio and electrical repair
Miscellaneous manufacturing	Taxidermists, sign painting shops, miscellaneous repair shops

With these two exceptions, the definition of manufacturing followed for the inter-industry flow study was the same as that used by the Census of Industry. It should be pointed out that although the value of products is defined "at the works", the boundary of the establishment is sometimes defined rather broadly. For example, bread manufacturers deliver their products directly to the household. In this case the value of bread produced is the delivered value to the household and the transportation activity of the manufacturing plant is included as part of manufacturing.

Where possible when an industry performed contract or custom work, only the amount received for performing this work, not the total value of the commodities, was included in the output of the establishment performing the custom work. The Census of Industry gross value of production figures for the grain mill product and wood products (exc. furniture) industries were adjusted to exclude the value of commodities on which custom work was done. Only the amount received for doing this work was included as output. An adjustment was also made to materials used figures in these industries.

For a few industries the figure reported to the Census of Industry was gross value of shipments. An estimate of the change in inventories of finished products was added to obtain the gross value of production. This adjustment was made for the meat packing and slaughtering, pig iron, steel ingots and

castings, rolled iron and steel products, Portland cement, lime, domestic clay products, and salt industries.

Other comments on or adjustments to the Census of Industry gross value of production figures are as follows:

(a) Fish processing

An addition was made to the Census of Industry figure to include an estimate of the production of inland fish processing establishments and the estimated production of Newfoundland fish processing establishments.

(b) Alcoholic beverages

For the distilled liquor and wine industries the goods in process inventory adjustment is implicit in the method used by the Census of Industry in calculating gross value of production. An adjustment was made in the distilled liquors industry for the difference between the value of the change in the inventory implicit in the Census of Industry figures and those obtained from the inventory worksheets of the National Income Section.

(c) Primary iron and steel

Because of the large volume of intra-company transfers between establishments within the primary iron and steel industry and between that industry and the wire and wire goods industry, only the sales of the pig iron, steel ingots and castings, and the rolled iron and steel products industries are included in the gross value of production by the Census of Industry. Such a large proportion of the total production of pig iron, for example, is transferred between establishments within the same company that it is difficult to establish a realistic value for it. For the inter-industry study, however, an estimate of the value of intra-company transfers to establishments in the wire and wire products industry was added to the gross value of production. This required that an adjustment be made to the cost of materials used in the latter industry. Revaluation of the value of production of some commodities resulted in a further increase in the gross value of production.

(d) Products of petroleum and coal

Establishments whose principal activity was manufacturing or distributing heating and illuminating gas are classified for the inter-industry study in the gas manufacture and distribution industry in the electricity, water, and gas utilities group. The gross value of production of the products of petroleum and coal industry was therefore reduced by the gross value of production of these establishments. The sales of gas by plants in the coke industry to their distributors in the gas manufacture and distribution industry was added to the gross value of production. An upward revision of \$50.9 million was made to the gross value of production of the petroleum refining and products industry to correct an error in valuing production which was revealed in the 1954 Census of Industry.

6. Construction

The construction industry was defined for the inter-industry study to include all new and repair construction put in place in Canada in 1949, whether put in place by the construction industry proper or by the labour force of other industries. This is the same definition as that appearing in D.B.S., *Private and Public Investment in Canada, 1946-1957*. This latter publication incorporates a revision to the estimate of repair expenditure on residential buildings which was made after completion of the inter-industry computations.

7. Transportation, Storage, and Trade

(a) Transportation

The transportation industry includes all establishments primarily engaged in the provision of transportation services. Transportation services provided by the labour force of establishments classified in other industries are classified in those industries. Because of the closely integrated nature of railway, express, and telegraph services in Canada, these services are all classified in the transportation industry. Hotels and restaurants operated by railway companies, however, are classified in the personal service industry.

Estimates of total revenue for air transportation, interurban bus and coach lines, steam railways, urban and suburban passenger transportation, water transportation, and international bridge, tunnel and ferry companies were obtained from the publications of the Transportation Section of the Bureau's Public Finance and Transportation Division.

The D.B.S. publication *Motor Carriers: Freight and Passenger* contains some detail on trucking revenues. The coverage of this field is incomplete and adjustments were made on the basis of information on incorporated companies contained in *Taxation Statistics, 1951*, and on employment in the industry as reported in the *Census of Canada, 1951*, Volume V. Revenues of oil pipelines were estimated on the basis of 1950 information. Estimates of revenues from taxicab operations were based on information made available by the National Income Section. Revenues of government companies classified in this industry, and not included in the above publications, were obtained from the *Public Accounts*. Estimates of revenues of stevedoring companies were based on employment as reported in the *Census of Canada, 1951*, Volume V.

(b) Storage

The estimate of revenue of grain elevators was made on the basis of revenue per bushel of grain handled by elevators. The D.B.S. report *Warehousing* gives revenues for other establishments classified in this industry.

(c) Trade

Since industries are shown in the table as if they sold their products directly to the user, the trade sector is not shown as purchasing goods

intended for resale without further processing. The output of the sector is the sum of (i) the gross profit earned by selling goods (net sales less cost of goods sold), (ii) the total revenue from repair services performed by trade establishments, and (iii) the service cost of meals served by retail trade establishments. The trade sector includes the gross profit margin on all goods sold for resale without further processing by all establishments, whether these are trade establishments or whether they are establishments classified to manufacturing or service industries. Because of statistical problems, however, some of the net profit margin on goods sold without further processing was left in the industries in which the establishments were classified.

The estimate for retail trade was derived in the following manner: The Merchandising and Services Sections of the Bureau conduct a survey every second year and publishes statistics on *Operating Results and Financial Structure* of "relatively pure" retail trade store types (stores which derive at least eighty per cent of their revenue from the sale of a particular group of commodities). These data suffer from the limitation, however, that the sample is not random and the representativeness of the sample has not, as yet, been satisfactorily determined. A weighted average retail gross profit margin for retail trade was derived by weighting the gross profit margins obtained from the operating results survey by 1951 retail sales figures obtained from the *Census of Canada, 1951*, Volume VII. This average was applied to the total retail sales, 1949 as published in D.B.S. Reference Paper 56 *Retail Trade, 1930-1951*. (Sales of establishments classified as eating and drinking places and tailoring and made-to-measure stores were excluded, however, and an estimate of retail merchandise sales by service and other establishments added.) An adjustment was made to make the estimate of gross domestic product originating in the industry consistent with the figures obtained from the *National Accounts*. The resulting gross profit was about twenty-one per cent of net sales. To this margin was added an estimate of the materials used in repair work done by retail stores in order to arrive at the total output figure for retail trade.

For wholesale trade, the estimate of total gross profits is probably subject to a much larger error than for retail trade. The Bureau's survey of operating results covers only wholesalers proper; thus no data are available for agents and brokers, assemblers of primary products, and petroleum bulk tank stations, and manufacturers' sales branches and offices. A weighted average gross profit margin for wholesalers proper was derived by weighting the gross profit margins for various types of wholesalers proper by their 1951 sales. The result was an average of about fourteen per cent of net sales. This average was then applied to an estimate of 1949 sales of wholesalers proper projected from the 1951 Census figure. In the absence of gross profit data for other types of wholesalers, modifications

were made to the data for wholesalers proper and applied to an estimate of 1949 sales by other types of wholesalers, which was estimated from data in the 1951 Census.

8. Communication

(a) Radio broadcasting

This industry included both private establishments primarily engaged in the operation of radio services and the domestic service of the Canadian Broadcasting Corporation. Total revenue for privately owned radio broadcasting statistics was estimated from figures submitted to the Royal Commission on National Development in the Arts, Letters and Sciences and published in the *Canada Year Book, 1954*, pp. 894-895. These data include the number of stations, average profits, and profits as a per cent of sales, thus making possible an estimate of total income. The gross income of the Canadian Broadcasting Corporation was obtained from its annual report.

(b) Telephone

Total revenue of establishments, whether owned by government bodies or private organizations, primarily engaged in the operation of telephone services is published in D.B.S., *Telephone Statistics*.

(c) Other communication services

The revenue of establishments primarily engaged in the provision of cable services was obtained from D.B.S., *Telegraph and Cable Statistics*. A small amount was added to this to cover messenger service.

(d) Post Office

The Post Office, for National Accounts purposes, is classified in the communication industry. Like other government establishments its output is measured as the sum of its expenditures on current account (including any profit or loss).

Rural mail carriers operate on their own account and should be treated as unincorporated businesses. Their gross revenue was estimated from their net income and on the assumption that their only expenditure was for automobile expenses. It was assumed that net income was 40% of gross income. Payments by the Post Office to rural mail carriers appear as intra-industry consumption in Table 1.

9. Electric Power, Gas, and Water Utilities

(a) Electric light and power

This industry includes all establishments, whether operated by private or public organizations, primarily engaged in the generation, transmission, and distribution of electricity together with all electricity produced for sale by establishments

whose principal activity classifies them in other industries, for example, pulp and paper. The source of the total revenue estimate is the D.B.S. report *Central Electric Stations*.

(b) Gas manufacture and distribution

This industry included establishments primarily engaged in the distribution of manufactured or natural gas for fuel and lighting purposes. Establishments classified here may manufacture their own gas. Coke produced as a secondary product by gas plants using by-product ovens is also included in the output of this industry. The production of natural gas is classified in the coal mining, crude petroleum and natural gas industry group. Data on the manufacture and distribution of manufactured gas are published in the D.B.S. report on the *Coke and Gas Industry* and on the distribution of natural gas in *Crude Petroleum and Natural Gas*.

(c) Water distribution and related services

The principal item in this group is municipal waterworks. Sewage disposal and other sanitary services are operated as a part of municipal general government establishments and are included in the government service industry. Information on waterworks was not available for all provinces so the revenue per household with running water was calculated for Ontario, for which data were available, and this figure was multiplied by the total number of households in Canada with running water, to arrive at total revenues. Estimates of the number of households with running water from a public source were obtained from the 1941 and 1951 *Census of Canada* (Volume IX, 1941; Volume III, 1951).

(d) Other utilities

Estimates of the revenue of other public utilities (mainly steam heat) were obtained from Department of National Revenue, *Taxation Statistics, 1951*. These revenues accounted for less than one per cent of the total revenue of this group.

10. Finance, Insurance, and Real Estate

(a) Banking

Data on the chartered banks are published in the *Bank of Canada Statistical Summary Financial Supplement, 1954*. Information from the National Income Section worksheets supplied the estimate of imputed charges. The annual report of the Bank of Canada furnished information on its operations.

(b) Investment and loan

Total revenue of incorporated personal and business credit companies; investment trust and holding companies; and stock, bond and commodity dealers was obtained from *Taxation Statistics, 1951*. To conform with the treatment in the National Accounts, an adjustment was made to remove the "transfer" portion of interest received from consumer loans. An adjustment should also have been made for interest received from business loans but

because of statistical difficulties this was not done. Reports issued by the federal government and the Provinces of Ontario and Quebec cover the income of almost all trust and loan companies in Canada. The combined total income of unincorporated stock, bond and commodity dealers, real estate agents and insurance agents was available from *Taxation Statistics*. It was possible to estimate the portion of this going to insurance agents, but the allocation of the remainder between stock, bond and commodity dealers and real estate agents was arbitrary. Annual reports of government companies and boards provided data on their expenditure.

(c) Life insurance

Data on life insurance companies are contained in Volume II of the annual reports of the Department of Insurance. To this was added an estimate for mutual companies. An adjustment was also made to subtract the portion of expenses of Canadian companies applicable to foreign operations.

(d) Non-life insurance

The item "capital consumption allowances and miscellaneous valuation adjustments" includes the claim portion of insurance against fire and other damage to business property (including all residential property) and the claim portion of business insurance against financial loss (fidelity insurance). The output of non-life insurance companies was therefore defined as total premiums paid less claims paid. Data on these companies are contained in Volume I of the annual reports of the Department of Insurance. Whereas life insurance agents are considered part of the life insurance companies, agents for non-life insurance are part of separate companies. Commissions paid to non-life insurance salesmen are therefore considered as the gross income of independent companies and are shown as a payment of non-life insurance companies to insurance agents.

(e) Real estate

The output of the real estate industry was defined to equal the sum of: (i) paid and imputed residential farm and non-farm rents, (ii) paid farm and non-farm non-residential rents, (iii) gross income of real estate agents, and (iv) expenditure of government companies classified to this industry (including Central Mortgage and Housing Corporation).

The estimates of gross rents were taken directly from the National Income Section's worksheets. Residential non-farm rents were estimated by multiplying an estimated average rent figure by the number of rented dwellings in Canada. Farm rents are published in D.B.S. Reference Paper No. 25, *Handbook of Agricultural Statistics, Part II*. Data on rents paid by corporations were obtained from *Taxation Statistics*. Rents paid by unincorporated trade establishments were estimated on the basis of data obtained in the operating results survey, while rents paid by other unincorporated business were estimated on a rough basis. Rents paid by the federal Government were obtained from

the *Public Accounts*. Although these estimates of gross non-residential rents do not appear in the *National Accounts* they were estimated by the National Income Section as part of the procedure in arriving at an estimate of non-residential rents received by persons.

Income of incorporated real estate agents was obtained from *Taxation Statistics*. As explained previously, total income of unincorporated finance companies is in *Taxation Statistics* but the portion to be allocated to real estate dealers was arbitrary.

11. Service Industries

Since the trade industry is defined to include the gross profit margin on all goods sold without further processing by the selling establishment, retail sales of merchandise were excluded from the output of the service industries. In the revised *National Accounts*, the service portion or cost of serving food and alcoholic beverages for on-premise consumption is treated as a service expenditure, whereas the expenditure on the food and beverage themselves is treated as a commodity expenditure. To make it easier to relate figures in Table 47 of the *National Accounts* to the inter-industry flow table, in the latter table the food and beverages purchased in hotels, restaurants, taverns, and other service establishments were shown as if they were purchased directly from the manufacturer or primary producer and the service portion of the cost shown as a purchase from the service industries. The output of the service industries includes therefore only the cost of serving food and alcoholic beverages for on-premise consumption and excludes the value of the food and beverages themselves.

(a) Community or public service

This industry includes all establishments engaged in the provision of education, health, or welfare services. These establishments may be either privately or publicly owned; thus, all municipal schools and federal and provincial hospitals and schools are included in this industry. Data on municipal schools are published in the *Canada Year Book*, 1952 page 53. The worksheets of the Bureau's Education Division provided information on other educational institutions. The publications of the Bureau's Health and Welfare Division provided data on mental institutions, hospitals, and tuberculosis institutions. The gross income from independent professional practice of medicine, dentistry, and nursing is partly obtained from *Taxation Statistics* and partly from surveys conducted by the National Income Section of doctors, dentists, and nurses (see *National Accounts*, p. 149). An estimate for religious and welfare institutions was made on the basis of data published in D.B.S. *Census of Welfare Institutions*, 1946.

(b) Public administration and defence

This industrial group is defined, as closely as the available data for 1949 permitted, according to the D.B.S. Standard Industrial Classification. It

includes most government departments, including all the operations of the Department of National Defence, but excludes government business enterprises (including the Post Office), and government agencies engaged primarily in providing communication, trade, health, and education services and all construction work. The total output of this industry group was measured residually as follows:

Government expenditures on current goods and services (Table 2 of the <i>National Accounts</i>)	\$1,620 million
Less: Current expenditures of government establishments (other than business enterprises) classified in the following industries:	
Communication	8
Trade	2
Health	68
Education	214
Imputed rent and capital consumption allowances on government buildings	97
Public administration and defence	\$1,231 million

The item "imputed rent and capital consumption allowances on government buildings" which was introduced into the revised *National Accounts* (as a replacement for interest on the public debt as a measure of the income generated by government assets) is all included in the service industry group since almost the entire amount relates to buildings used by establishments classified to this industry. It is included in the output of this industry group and its two components are included in rows 49 and 51, respectively, of column 42.

(c) Recreational service

The *Census of Canada, 1951*, Volume VIII, "Distribution-Wholesale Trade and Services," Table 21, contains gross revenue figures for establishments classified in amusement and recreation. From the Census group, rental libraries were transferred to community service. Theatrical services and coin-operated machine rental and repair, which are classified by the Census of Distribution in business services, were transferred to the recreation group. The 1951 figures were adjusted to the 1949 level by straight-line interpolation with the 1941 Census figures. An addition was made to include paramutual betting, itinerant picture exhibitors, and undercoverage of orchestras. Some associations of individuals, such as golf clubs, riding stables, and so forth, were excluded because of lack of data and their expenditure treated as direct personal expenditure.

(d) Business service

The *Census of Canada, 1951*, Volume VIII, Table 21, provides gross revenue figures for establishments classified in business service. From this group sign painting shops were transferred to miscellaneous manufacturing, dental laboratories to community service, dwelling and building services to personal service, theatrical services and coin-operated machine rental and repair to recreation service. Estimates of accounting, engineering and

scientific, and legal services were made on the basis of surveys conducted by the National Income Section and from data in *Taxation Statistics*. (See *National Accounts*, p. 149.) The business service industry was defined as selling all advertising purchased by industry; thus, the industry is shown as buying the following advertising output of the printing and publishing, miscellaneous manufacturing, and communication industries and selling it to the actual purchaser:

Printing, publishing, and allied industries	\$158.9 million
Revenue from advertising	117.9
Advertising materials	41.0
Miscellaneous manufacturing industry	8.2
Communication industry	18.6
	<hr/> \$185.7 million

(e) Personal service

The *Census of Canada, 1951*, Volume VIII, publishes gross receipts for establishments classified in personal service. From this group shoe repair shops were transferred to the leather products industry, and travel bureaus and ticket agencies to the transportation industry. Transferred to personal service were the undertaking and funeral service group, photography group, and hotel and tourist group. From retail trade were transferred eating and drinking places. Board and lodgings are also included in this industry; the estimate for universities was obtained from the Education Division while that for rooming houses was based on the 1947-48 survey of family expenditure and projected on the basis of restaurant sales. An imputed amount for board and lodgings provided free of charge to workers was estimated by the Labour and Prices Division. An estimate for domestic services was projected on the basis of the *Census of Canada, 1941*.

B. Inter-Industry and Imported Input

Since an inter-industry cell of Table 1 represents both the input into an industry and the output of an industry, the inter-industry cells can be filled in either by estimating the inputs into each industry or by estimating the disposition of output of each industry. The method chosen was to estimate the inputs into each industry. When this was done it was found that there was still some unallocated input and output. Some of the output of some industries (as well as imports) was then assigned to the using industry on the basis of the nature of the commodity — some commodities are obviously designed for use in particular industries.

In general, the method of allocating inputs into an industry according to the industry of origin was to first determine the value of the various commodities and services used as inputs into an industry and then to determine the industry of origin. This involved assembling total "domestic supply" figures for groups of commodities — domestic production less exports for each industry group which produced the commodity, plus imports.

Merchandise import data as published in *Trade of Canada*, Volume III, show the value of merchandise imports f.o.b. point of shipment (i.e., excluding charges such as freight, insurance, handling, duties or taxes). To compare the value of imports with those of similar commodities produced by a domestic industry, it was necessary to value them at a common point — the delivered price to the user. To the f.o.b. point of shipment value was added, therefore, an estimate of custom duties and distribution costs involved in moving the goods to the using site.

In the cases where more than one industry used the commodity and that commodity was produced by more than one industry or by a domestic industry and also imported, a decision had to be made as to the source of supply. In most cases, however, the industry groupings were so broad that all of a commodity was produced within the same group. The majority of difficult cases were associated with the metal-using industries. It was sometimes found that the average unit value of the material provided a clue to its industry of origin. Where no other clue existed, the total "supply" was prorated among the various users in accordance with the amount produced by each supplier.

Since output is defined at producers' prices, the costs of distributing the output of an industry from producer to user are included as input into the purchasing industry. These distribution costs include transportation costs, warehousing and storage charges, wholesale and retail trade margins, and so forth. The method of making these estimates for output destined for final output sectors is explained in Section C. For inter-industry transactions, in those cases where both physical quantity and value data were available for both use and production of a commodity, the average unit value at the producing plant and the average unit cost to the user were compared. The difference between these two averages measures the unit "spread" between purchasers' and producers' prices. For most inter-industry transactions no taxes were included in this spread. Where taxes were levied, however, the tax portion was then estimated and subtracted from the spread. The total distribution cost was then obtained by multiplying the spread (excluding taxes) by the number of units used. Where physical quantity data were not available, the spread was assumed to be the same as for similar transactions for which physical quantity data were available.

This spread was then entered in the transportation, storage, and trade row of the table in the column for the industry purchasing the commodity. Because of the difficulty in determining the transportation, storage, and trade components of spread separately for all transactions, these three industries were grouped together in the inter-industry flow table.

The spread between the value of imports f.o.b. point of shipment and the cost to the user was estimated in a similar manner. In this case, however,

customs import duties were frequently included in the spread and these were then estimated and subtracted from the spread. The total spread (excluding taxes and duties) on imports was then totalled for each industry using imported goods. An estimate was then made of the portion of the spread which applied to the difference between the value of imports f.o.b. point of shipment and the value c.i.f. the Canadian border. This portion of the spread was included in the import row of the table in the column for the industry using the imported goods. The residual amount of spread (the portion relating to distribution from the border to the using site) was included in the transportation, storage, and trade row for the industry using the goods.

The only intermediate input, except merchandise imports, for which there was a common source for all industries was repair expenditure. Data on these expenditures are published in *Private and Public Investment in Canada, 1946-1957*. Since all new and repair construction was assumed to have been put in place by the construction industry, all repair construction expenditure was defined to be an input from the construction industry. One adjustment was made, however, to the published industrial distribution. The data collected are on plant and equipment used by an industry. This may include rented buildings. For the inter-industry study, however, all rental activity was assumed to have been carried on by the real estate industry. An estimated amount of repair expenditure on rented buildings was therefore transferred from the industry where the building was used to the real estate industry.

The treatment of repair expenditure on machinery and equipment was more difficult. In the first place, if the establishment made its own repairs, this figure included wages paid to the labour force of the establishment which were already included in the estimate of wages and salaries paid to workers in the industry. A rough adjustment was made to eliminate this double counting. Secondly, for some manufacturing industries repair expenditure was included in materials used; an adjustment was also made to remove this double counting. The residual amount of expenditure could represent payments to several industries — rubber products, furniture, agricultural implements, other iron and steel products, transportation equipment, electrical apparatus and supplies, and so forth — or payments for imported parts. The allocation was quite arbitrary although knowledge of the nature of machinery and equipment used in a particular industry provided a guide.

1. Agriculture

Data on farm operating expenses are published in D.B.S. Reference Paper 25, *Handbook of Agricultural Statistics*, Part II. Adjustments were made to these figures to make them consistent with the adjustments to gross income made for the inter-industry study. Where necessary a further breakdown of some expenditure items was made, in some cases

on the basis of production figures for the materials, in other cases on estimates made on the basis of related indicators.

2. Forestry

D.B.S. takes each year a sample of the more important concerns carrying on logging operations regularly in Canada. The firms so covered in 1949 produced about one-third of that year's total cut. From this survey data were obtained on expenditure on supplies. These estimates were inflated to an estimate of total expenditure for the industry. Since the sample covered only the larger operators, the assumption that smaller firms' expenditure on supplies was in the same proportion as for larger firms may not be justified. The large unallocated input in this industry is an indicator that some error, as yet undetermined, was made.

3. Fishing, Hunting and Trapping

(a) Fishing

Data on expenditure by enterprises in the primary fishing industry were published in *Census of Canada, 1951*, Volume IX, "Fisheries", Table 16. These data were adjusted to the 1949 level by using the ratio of total landed value of fishery products in 1949 to 1951.

(b) Hunting and trapping

No data are available on supplies used by this industry. The total amount was therefore left in the unallocated row.

4. Mining, Quarrying, and Oil Wells

Data on expenses by these industries are published in D.B.S. Reference Paper No. 29, *Purchases of Capital Goods, Process Supplies and Specified Services by Canada's Mineral Industries, 1949*. For the inter-industry flow table, current expenditure was distinguished from capital expenditure. An adjustment was also made for some industries included in the inter-industry study as manufacturing or public utilities rather than mining. Data on payments to contract diamond drillers were obtained from D.B.S. report, *Contract Diamond Drilling in the Mining Industry*.

The inputs into the smelting and refining industry were estimated in the same manner as those for manufacturing industries.

5. Manufacturing

(a) Materials, fuel and electricity used

Data on materials, fuel and electricity used are collected on the D.B.S. Census of Industry. Commodity detail on materials are collected every year and in 1949 the instructions on the schedule read as follows:

"Materials and Supplies Used — Give the quantity and the laid-down value at the factory

of the materials and process supplies used in making products reported (below). Process supplies should only include the expenditures made in keeping your machinery going, such as small parts, lubricating oil, etc. Do not include here overhead expenses, such as major repairs, office supplies, cost of fuel and electricity of any other expenditure not usually charged to 'materials account'. Report materials USED, not materials PURCHASED. Do not include

materials purchased for resale without further manufacture."

Detail on fuels used is collected about every five years, although the total use of fuel and electricity is collected every year. Detail on fuel used was collected in 1948 and adjusted to the 1949 level. The 1948 questionnaire was as follows:

"Fuel and electricity used during the year:

(State cost in each case as laid down at the works, including freight, duty, etc. Do not consider fuel purchased as representing fuel used unless the quantities are the same.)

Kind	Quantity	Cost at plant (Omit cents)
1. Bituminous coal (a) From Canadian mines	tons	\$.....
2. (b) Imported	tons	\$.....
3. Sub-Bituminous coal (from Alberta mines only)	tons	\$.....
4. Anthracite coal	tons	\$.....
5. Lignite coal	tons	\$.....
6. Coke (for fuel only)	tons	\$.....
7. Gasoline (include gasoline used in cars and trucks)	Imp. gals.	\$.....
8. Kerosene or coal oil	Imp. gals.	\$.....
9. Fuel oil (do not include lubricating oil)	Imp. gals.	\$.....
10. Wood (cords of 128 cubic feet of piled wood)	cords	\$.....
11. Gas (a) Manufactured	M cu. ft.	\$.....
12. (b) Natural	M cu. ft.	\$.....
13. Other fuel (state kind and quantity)		\$.....
14. Electricity purchased (include service charge in cost)		
(a) For lighting and motors	kwh.	\$.....
15. (b) For other purposes	kwh.	\$.....
16. Total		\$.....
17. Electricity generated for own use		kwh.
18. Electricity generated for sale	kwh.	\$.....

To the Census of Industry figures for manufacturing were added rough estimates of cost of commodities used or sold and the cost of fuel and electricity for repair establishments classified to manufacturing (see section A).

The use of containers and packaging materials posed a difficult problem in many industries since the types of containers and materials were not itemized. For these industries a rough estimate of the value of the various containers used was made. The residual amount of containers produced which were not assumed to have been consumed by manufacturers, except for a small allowance for household use, were assumed to have been used by the trade industries.

The adjustment for custom work discussed in section A was made to the grain mill products and wood products (exc. furniture) industries.

Other significant adjustments made to Census of Industry figures were as follows:

(i) Fish processing

An addition was made to the Census of Industry figure to include an estimate of the cost of materials used in inland fish processing establishments and in Newfoundland fish processing establishments and an adjustment made to the cost of fuel and electricity.

(ii) Primary iron and steel

The cost of materials used was increased by the value of scrap iron and steel transferred from an establishment in another industry to an establishment of the same company in the primary iron and steel industry.

(iii) **Iron and steel products, n.e.s.**

The cost of materials used was increased to include intra-firm shipments from the primary iron and steel industry to the wire and wire goods industry.

(iv) **Products of petroleum and coal**

Establishments whose principal activity was manufacturing or distributing heating and illuminating gas are classified for the inter-industry study to the gas manufacture and distribution industry. The cost of materials used and the cost of fuel and electricity used by the products of petroleum and coal industry were therefore reduced by the amount of this transfer.

(v) **Chemicals and allied products**

The cost of materials used in the chemicals and allied products industry was reduced by the cost of containers used in the compressed gas industry since the cost of these containers was classified as a capital expenditure for this study.

The Census of Industry in 1949 did not collect data on specific materials used for some industries in the clothing and in the transportation equipment industry groups. The gap in data for the clothing industry was filled by allocating unallocated amounts of materials produced in the textile, clothing, and miscellaneous manufacturing industries of a kind used in making clothing. A rough estimate of the spread between producers' and purchasers' prices was also made. For the aircraft and motor vehicles industries the estimates were based on the United States Department of Labor, Bureau of Labor Statistics, "Table of the Inter-industry Flow of Goods and Services by Industry of Origin and Destination, Continental United States, 1947" (Division of Interindustry Economics, October, 1952).

(b) **Other input**

The sources and methods for repair expenditure are explained above. If the total cost of materials, fuel, and electricity used; repair expenditure; wages, salaries, and supplementary labour income; corporation profits before taxes, other income, and depreciation allowances and similar business costs is subtracted from the gross value of production (f.o.b. plant, excluding excise taxes and excise duties) a residual amount of miscellaneous intermediate inputs plus property and other miscellaneous taxes is obtained. This residual includes expenditure on advertising, telephone, telegraph, insurance, rent, office supplies, professional fees, and so forth. Almost no recent data are available on these expenditures. For advertising, Table 8 of D.B.S. Reference Paper No. 67 *Advertising Expenditures in Canada, 1954* contains the ratio of total advertising costs (including internal costs) to sales of large firms in each industry for 1954. Other data available are from a survey of manufacturing firms for the year 1936 conducted by the Dominion Bureau

of Statistics for the Rowell-Sirois Commission. (The results of this survey were published by Donald C. MacGregor, "Manufacturing Expenses, Net Production, and Rigid Costs in Canada," *Review of Economics and Statistics*, XXVIII (May, 1945), 65.) This survey collected data on operating expenses as a per cent of net sales, collecting the following items which have been rearranged to a form relevant to this gap in inter-industry data:

1. Net Sales
2. Less: Goods bought for resale
3. Payments to public carriers
4. Federal sales taxes
5. Net Total (1-2-3-4)

Miscellaneous expenses:

6. Professional and other fees
7. Operating expenses (except payroll) of own transport services
8. Stationery, office supplies, printing
9. Travelling expenses
10. Advertising
11. Telephone, telegraph, cable
12. Miscellaneous administrative
13. Rent
14. Insurance
15. Patents, royalties, etc.
16. Municipal taxes on property
17. Miscellaneous
18. Total (6+...+17)

The ratio of total (5) to total (18) approximates as closely as the data permit the ratio of "other intermediate input" (including property and other miscellaneous taxes) to gross value of shipments of products of own manufacture, f.o.b. plant excluding excise and sales taxes (gross value of production less inventory change of goods in process and finished goods). The total amount of these expenses arrived at by the residual method was \$1,008 (or 8.4 per cent of the gross value of shipments); using 1936 percentages applied to 1949 gross value of shipments \$954 was obtained (7.9 per cent of the gross value of shipments). Although the two aggregates are fairly close, this does not mean that the individual components have not changed very much over time. Some of them, moreover, bear little relation to sales—for example, property taxes. For want of other information these ratios were used for a preliminary estimate of these inputs into manufacturing. The total for each expense was then added for all industries and compared with the total output which had to be allocated. The industrial distribution of the expense item was then adjusted to add to the predetermined total by adjusting the estimate for industries where the estimate was not based on reliable recent information. Since this procedure was followed, the total output of most non-commodity producing industries was allocated to a using industry. The fact that zero is shown in the unallocated column does not, therefore, mean that the distribution of output is of a higher degree of accuracy than those with large unallocated outputs.

6. Construction

The estimate of the value of materials used in 1949 was made by applying the percentage of the cost of materials used to value of construction put

in place in 1951 to the total value of construction put in place in 1949. These data were obtained from D.B.S., *Construction in Canada, 1953-1955*.

In order to estimate the commodity content by industry of origin of the materials used in construction, commodity flow studies were made. From data collected by the 1949 Census of Industry, the gross value of production (f.o.b. plant, excluding excise taxes) for all construction materials was obtained. From the total value of production for each material was subtracted an estimate of the amount used in other industries, exports, and a rough adjustment made in some cases for change in inventories. The residual figure so obtained was assumed to be the amount that was used in construction. In order to raise the total value of these materials to the actual cost to the user, estimates of total excise taxes, transportation and storage costs, and trade margins were added in the appropriate rows.

A similar procedure was followed with imports. Total imports of construction materials were obtained from *Trade of Canada, 1949* and deductions were made for use of these materials in other industries. Customs duties, as reported in *Trade of Canada*, were added and estimates of the amount of excise taxes, transportation and storage costs, and trade margins added.

An overall adjustment was then made in order to make the components add to the estimated total cost of materials used in 1949.

Since the estimates were made residually, any error in the estimates of other use of these materials would of course affect these estimates. Moreover, errors in allocating taxes, transportation, storage cost, or trade margins should also be taken into account. The lack of reliable information on the use of some of these materials by consumers for non-construction purposes introduces another source of error into the estimates.

7. Transportation, Storage, and Trade

(a) Transportation

The expenses for some industries (steam railways, urban and suburban transportation) are classified according to the object or purpose for which the expenditure is made (e.g. maintenance of equipment). It was necessary to translate this classification into a goods and service classification (expenditure on locomotive parts) and then into an industry-of-origin classification (transportation equipment industry). This translation of classifications (which also applied to some other industry groups, such as trade, the post office, and government service) involves considerable guesswork even though it is possible to ascertain the items making up the totals. Information was not available, however, on the amounts for each component of an object classification.

In most cases data on expenditure were obtained from the publications of the Transportation Section of the D.B.S. Public Finance and Transportation Division. For air transportation, a more detailed breakdown of expenses for Trans Canada Airlines, which received sixty-five per cent of the total revenue of air transportation companies, was obtained from its annual report and used to supplement the information of air transportation companies published in D.B.S. *Civil Aviation*. Similarly the annual report of the Canadian Steamship Lines provided additional detail for the water transportation industry. Expenses of government companies were obtained from the *Public Accounts*, where the classification was on an object of expenditure basis.

(b) Storage

Expenses were obtained from D.B.S. report *Warehousing*, and an amount added to cover grain elevators.

(c) Trade

A percentage breakdown of profit and loss data of selected retail trade stores is contained in D.B.S. *Operating Results and Financial Structure*. The items collected are as follows:

Gross profit

Operating expenses:

Employees' salaries and wages

Taxes

Insurance

Rent

Heat, light and power

Delivery

Repairs and maintenance

Depreciation allowances

Store supplies

Advertising

Bad debts written off

(Less) amount recovered

Net bad debt loss

All other expenses

Total operating expenses

Net trading profit before deduction of proprietors' salaries and income tax

Each item of the expenses for each store type was weighted by the 1951 sales figures obtained from the *Census of Canada, 1951*, Volume VII; the weighted average so derived was applied to the 1949 sales figure. It was necessary, in some cases, to arbitrarily translate a function of expenditure classification (e.g. heat) into a goods and services classification (coal, fuel oil, gas) and then into an industry-of-origin classification (coal mining, imports, and so forth). A rough estimate was made of the materials used in repair work and the food used in preparing meals sold in retail trade establishments.

For wholesalers proper a similar method was followed. Using the figures for wholesalers proper as a basis, the percentage of net sales spent by other types of wholesalers on various operating expenses was estimated. These percentages were then applied to the 1949 total sales figures.

8. Communication

Very few data were available on expenses and rather arbitrary estimates were made. The expenses for the whole telephone industry were estimated on the basis of information on the Bell Telephone Company of Canada published in its annual report. Expenses of cable companies were allocated on an arbitrary basis.

Expenditure data for the Canadian Broadcasting Corporation were obtained from its annual report while the data referred to in Section A.8(a) on private radio stations was used for their expenditure.

Expenditure by the Post Office was obtained from the *Public Accounts*. Expenditure by rural mail carriers was assumed to be entirely for automobiles.

9. Electric Power, Gas, and Water Utilities

(a) Electric light and power

Details on expenses of Ontario and Quebec Hydro-Electric Power Corporations were obtained from their annual reports. These were used to allocate the expenses of all central electric stations.

(b) Gas manufacture and distribution

Since these industries are covered by the Census of Industry, the estimation procedure was the same as for mining and manufacturing industries.

(c) Water distribution and related services

Details of expenses for the cities of Ottawa, Winnipeg, Saint John and Vancouver were obtained from the municipal reports. Most use was made of the city of Ottawa report, which had the most detailed information, and this was used to allocate expenses of all waterworks. Expenditure on chemicals was estimated on the basis of data published in *Consumption of Chemicals in Municipal Waterworks, 1949* (a report prepared by the D.B.S. Metals and Chemicals Section).

(d) Other public utilities

Rough estimates were made for the rest of the public utility group.

10. Finance, Insurance and Real Estate

(a) Banking

Data for broad categories of expenses for the chartered banks were obtained from the *Bank of Canada Statistical Summary, Financial Supplement, 1954*, p. 34. The expenses of the Bank of Canada are available from the *Proceedings of the Standing Committee of the House of Commons on Banking and Commerce, First Session of the Twenty-Second Parliament of Canada, 1954*, p. 734.

(b) Investment and loan

The reports issued by the Ontario, Quebec, and federal governments contain information on the expenses of trust and loan companies. The annual report of the Department of Insurance provides details of operations of companies engaged in personal credit. The expenses of business credit companies were allocated according to the distribution of personal credit companies. Although detailed expenses (on an object of expenditure basis) were available for trust and loan companies and personal credit companies, very little information was available for other parts of this group.

(c) Life insurance

Expenses of life insurance companies are published in Volume II of the Department of Insurance annual reports. Ratios devised by the National Income Section were used to subtract out the portion of expenses of insurance companies applicable to foreign operations and to add in the expenses of mutual companies.

(d) Non-life insurance

Expenses of non-life insurance companies are contained in Volume I of the annual reports of the Department of Insurance. An addition was made for the expenses of fraternal and foreign companies for which detailed figures are not available. A rough estimate of the industry from which the goods and services used by insurance agents were obtained was made.

(e) Real estate

The estimates of expenses connected with residential buildings and farm non-residential rental buildings were taken from the worksheets of the National Income Section. Estimates were made for non-farm non-residential buildings. Expenses of real estate agents were allocated on a very rough basis. The annual reports of Central Mortgage and Housing Corporation provided information on its operations.

11. Service Industries

(a) Community or public service

Expenditure data for hospitals are published in *D.B.S. Annual Report of Hospitals*, data for schools and universities in financial statements, in board of education reports, and in the reports of universities. A sample of the financial statements of eleven welfare institutions was used as a basis for allocating the expenses of all welfare institutions. The sample was not necessarily representative but was the only detailed information available. Some information on independent practice of medicine, dentistry, and nursing was obtained from surveys conducted by the National Income Section (see *National Accounts*, p. 97). A rough estimate was made for the expenses of other community service establishments.

(b) Public administration and defence

For the federal government the basis of the figures for intermediate input was a breakdown of the "Estimates" for 1949-50, prepared by the Treasury Board for the Senate Finance Committee, according to the recently adopted "Summary of Standard Objects of Expenditure and Special Categories." The percentage distribution derived from this table was applied, after certain adjustments were made, to the *National Accounts* figure of federal government expenditure on goods and services. From the "Standard Objects" the following adjustments were made in order to arrive at expenditure on new goods and services:

- (i) Land and used capital assets were excluded.
- (ii) All purely transfer and subsidy items, except payments abroad (which are treated as goods and services in government in order to offset the negative in the import figure, no production being involved), were excluded.
- (iii) The government special contributions to pension funds (re actuarial deficits and arrears) were eliminated. Only current contributions are included in goods and services.
- (iv) Post office expenditure not eliminated in the Treasury Board statement was deducted from the appropriate categories using the *Public Accounts* as a guide. (The post office was classified in the communications industry.)

The third stage was to eliminate the category "Estimated Savings and Recoverable Items" from the appropriate object categories. The amount refers to commitment authority provided for in the estimates, but against which cash will not be required in the fiscal year 1949-50. Commitment authority of this nature is only required where contracts have to be entered into which cannot be fulfilled within the fiscal year. Thus, materials and supplies, acquisition and construction of buildings, acquisition and construction of equipment, would be primarily affected. It was assumed that the entire adjustment applied to these three categories, and the amount was allocated on a pro rata basis.

These adjustments yielded a figure of \$955.8 million broken down by object of expenditure representing estimated cash requirements for 1949-50. This figure compares with actual realized expenditure for 1949-50 of \$858.3 million. On the face of it, this would seem to be a large discrepancy between the estimated cash requirements and actual cash outlays. The *Public Accounts* indicate, however, that an amount of \$167 million lapsed in that particular year; that is, this amount was estimated for and appropriated but was not actually spent.

The percentage distribution of the figure of \$955.8 million by object of expenditure was applied to the matching calendar year total in the *National Accounts*. Certain other adjustments required to bring this matching total to the final *National Accounts* figure of \$880 million were also made.

Once the estimates for calendar year 1949 had been made according to the "Standard Objects of Expenditure Classification," the task still remained to translate them into an industry-of-origin classification. This was done by coding the list of suppliers receiving \$10,000 or over published in the *Public Accounts, for the year ending March 31, 1950* according to the Standard Industrial Classification code for the establishment. The totals for S.I.C. codes were then aggregated into the industry groups used for the inter-industry flow study. Establishments which the S.I.C. codes as wholesale or retail trade were re-coded according to the industry producing the principal commodity sold by the establishment. In some cases the establishment's sales were not allocated because of the difficulty of determining the industry of origin of the goods sold.

The allocation of provincial and municipal government expenditure was a very difficult task since no "standard object" classification was used for reporting their expenditures. Use was made of readily-available information from the various public accounts but in the main the expenditures of these governments were allocated according to the pattern of non-defence spending by the federal government.

Net purchases of government commodity agencies are also included as an input into this industry.

(c) Recreational service

Details on operating expenses of the National Film Board were available from its annual report. No detailed information was available on the expenses of other establishments in this industry.

(d) Business service

The inclusion of all advertising revenue in the output of this industry resulted in the inputs listed on p. 34 being included as input into the industry. Very little information was available on the expenditure of establishments classified to this industry and so the estimates of other intermediate input are quite arbitrary.

(e) Personal service

The amount of required detail on commodity expenditures for estimation of intermediate inputs is seldom provided in sufficient degree for the needs of inter-industry studies. In the case of the D.B.S. publication on *Laundries, Drycleaners, and Dyers*, for example, the salaries and wages, cost of materials and supplies used, fuel and electricity, were given in broad individual groupings with "all other operating expenses" lumped together. The search for greater detail unearthed a number of financial statements with varying amounts of details on specific expenditures for commodities such as paper, etc., or for services such as rent, legal fees, etc. Since the financial statements could not be reliably used as a sample of the industry, an attempt was made to find some consistency between them for specific expenditures to serve as guide to estimating inter-industry inputs. Even though these

estimates were not entirely arbitrary, the basis for them cannot be defended as being very reliable. Estimates for other industries in the group were made in a similar manner or were based on very rough estimates.

12. Unallocated Input and Output

(a) Input

For manufacturing industries the unallocated input represents mainly materials used which were not specified in sufficient detail when reported to the Census of Industry to enable their assignment to the industry of origin. The remainder represents an allowance for various overhead costs which were not allocated in detail. As was explained above, total input for manufacturing industries was not estimated independently of total output so that the unallocated input item does not contain a residual error estimate component. For other industries the unallocated input item represents the difference between the sum of the various inputs which were charged specifically to the industry and the estimate of total output for that industry.

(b) Output

One problem which affected the estimates of the disposition of output of the various industries was the time period for which the various statistics were collected. All data should have referred to production and use during the calendar year 1949. In fact, however, establishments reporting to the Bureau's Census of Industry may report for their own financial year rather than for the calendar year. As a result discrepancies may occur between material used and production figures.

In some cases the figure reported in 1949 to the Census of Industry for gross value of production may have been gross value of shipments. Except for the cases listed in Section A, it was assumed, because of the lack of definite information, that the figure was production and no adjustment of change in inventory of finished goods was made. (In 1952 the Census of Industry began collecting data on shipments instead of production.) The figures reported for cost of materials and fuel used may, in some cases, have been that for materials and fuel purchased. Again because of the lack of certainty as to which figure was reported, no adjustment for change in raw material inventory was made. In the case of transfers between establishments within the same company, the reporting of arbitrary values may lead to some inconsistencies.

The content of the unallocated output for the various industries is as follows:

(i) Mining and Manufacturing Industries

Most of the unallocated output in these industries represents products reported to the Census of Industry in insufficient detail to enable them to be allocated to the using industry. Frequently a group of products is simply described as "other products"

(ii) Transportation, Storage and Trade

The unallocated output of this industry group represents the discrepancy between the estimate of total output of the industry group and the total of the estimates of the distribution costs incurred in moving goods from the various producing industries to the user. In the event that it can be determined that the output estimates for the transportation, storage, and trade industries are too high, the various inputs into the industry group must be reduced accordingly. If the output estimates are correct, the total input at producers' prices into various other industries must be increased to absorb these unallocated distribution costs. Insufficient evidence is available at the present time to determine which combination of these alternatives is correct.

(iii) Imports of Goods and Services

The reader is referred to Parts III.C and III.D.

C. Final Output

The totals for each component of final output were derived from the *National Accounts*. The reader is referred to pages 156-171 of that publication for a description of the sources and methods used in making the estimates. This Section describes only the additional steps that were required to translate the *National Accounts'* totals into an industry-of-origin classification.

1. Personal Expenditure on Consumer Goods and Services

These estimates were made under three broad categories: commodities, services, and net expenditures abroad.

(a) Commodities

Two methods are available for estimating personal expenditure on commodities: (i) using retail sales data, and (ii) the commodity flow method. Using the commodity flow method estimates are made by calculating the domestic disappearance of commodities produced in Canada or imported and applying to these figures the appropriate trade margins, transportation and storage costs, and indirect taxes in order to arrive at the price actually paid by the consumer. Since the inter-industry flow table requires an industry-of-origin classification of personal expenditure, the commodity flow method seemed more appropriate.

The starting point in making the commodity flow estimates for 1949 was to assemble the data on commodities produced by each Canadian industry. These data are published in the following D.B.S. publications: *Handbook of Agricultural Statistics*, *Quarterly Bulletin of Agricultural Statistics*, *Fur Production*, and various other reports published by the Agriculture Division and the reports on the forestry, fishing, mining, quarrying, oil well, and

manufacturing industries published by the Industry and Merchandising Division. The products of each industry were classified into the following groups:

(i) Finished goods of a type such that at least some of the output would probably have entered into personal expenditure.

(ii) Finished goods considered as capital goods in accordance with the definition of gross capital formation used for the National Accounts.

(iii) Materials used principally for construction.

(iv) Materials used principally for packaging.

(v) Other materials for further processing or assembly into other products.

(vi) Other commodities which would be used only as current inputs into industry.

(vii) A group of commodities which were not described in sufficient detail to determine their probable use.

In some cases it was not possible to put a commodity exclusively into one of these groups. For example, an automobile, when purchased by an individual for his own use, becomes personal expenditure. On the other hand, if the automobile is purchased for use by a business firm, it becomes part of gross capital formation. Commodities of this type were initially put into a "mixed" group and estimates made of the proportion which should be put into each of the groups listed above.

Consumer goods were further classified according to the channels of distribution through which they probably flowed to the final purchaser. Data collected in the 1951 Census of Distribution on commodity sales by various types of retail outlets were used for this purpose (*Census of Canada, 1951*, Volume VIII, Table 12). For example, although automotive chemicals and household soap are manufactured in the chemical products group, they are sold through different types of retail outlets and so were grouped separately in order that the proper wholesale and retail trade margin be applied to each. By this method commodity groups were set up in such a way that commodity flow estimates could be made using gross profit margin data that related to store types.

The estimation procedure then proceeded industry by industry. In most cases the original data were production figures; it was necessary, however, to arrive at the value of shipments from the industry. The change in inventories of finished goods of own manufacture was therefore applied to the production figure. A problem arose here because of the lack of commodity data. If an industry produces consumer goods, investment goods, and intermediate products, all three would be included in the inventory figure. To arrive at the amount that represented consumer goods, the total inventory change was prorated according to the proportion in which the three types of goods were produced by the industry.

The next step was to subtract the use of consumer goods used by other industries and exports. For example, sugar, although classified as a consumer good in the above classification is also a material used in the confectionery industry. (The method of estimating the use by other industries and exports is explained in Sections B and C.) In some cases an adjustment was also made for the change in inventory of these products held by other industries. The confectionery industry, for example, may include in its raw material inventories sugar produced by the sugar refining industry. In most cases the figure for change in raw material inventories was prorated on the basis of the proportion in which various materials were used in that industry. The residual figure obtained after these adjustments is shipments from the industry destined for personal consumption valued f.o.b. the producing plant and excluding excise taxes and duties. The manufacturers' sales tax and other excise taxes and duties were then estimated for each commodity.

In order to determine the wholesale and retail margins that should be applied to raise these values to the price actually paid by the consumer, it was necessary to estimate the percentage of shipments by manufacturers to various types of purchasers. Estimates were made of the proportion of manufacturers' sales directly to retailers and directly to persons and the residual amount was assumed to go to wholesalers.

In some cases an estimate for transportation costs from the manufacturer to the wholesaler was added where this cost did not seem to be included in the factory value nor in the wholesale gross profit margin. The next step was to estimate the value added at the wholesale level. An allowance had to be made at this stage for the disappearance of commodities into inventories at the wholesale level. Again the lack of commodity information on inventories held by wholesalers made this adjustment inexact. It was assumed that inventories at both the wholesale and retail levels were valued at cost although the practice might vary depending on individual accounting methods used by reporting establishments. To each commodity group was then applied the gross profit margin for the appropriate wholesale store type. An allowance was also made for the fact that sometimes more than one wholesaler handles the commodity before it is shipped to a retailer. The gross profit margins used were obtained in most cases from the biennial surveys of operating results and financial structure of retail establishments conducted by the Merchandising and Services Section of the Industry and Merchandising Division. (These data refer to relatively "pure" store types — stores which derived at least 80 per cent of their revenue from the sale of a particular group of commodities.) Data in the 1951 Census of Distribution were used to obtain estimates of the proportion of wholesale shipments directly to households (*Census of Canada, 1951*, Volume VIII, Table 12). The remainder was assumed to pass through retailers.

The next step was to estimate the value added at the retail level. Generally it was assumed that the cost of transporting goods from the wholesale to the retail level was included with the gross profit margin of the wholesaler or of the retailer. The figure for the total shipments to retailers was obtained by adding the estimate of shipments directly from manufacturer to retailer to the shipments from wholesaler to retailer. Again this figure was adjusted for change in inventories at the retail level. Because of the lack of commodity data the adjustment was again on a pro rata basis. Since separate gross profit margin figures were available for independent and chain stores, an attempt was made to determine what proportion of the commodity group flowed through each type of outlet. The gross profit margin for the appropriate retail store type was then applied and added to this was an estimate of provincial and municipal sales taxes where applicable. The figure so obtained was an estimate of the amount of personal expenditure on consumer goods purchased from retail stores.

To these sales were added the direct sales of manufacturers and wholesalers to consumers and an amount added for estimates of municipal and provincial sales taxes.

Since the inter-industry flow table is at producers' prices, expenditure on the output of each goods-producing industry was shown at the value f.o.b. the producing industry, excluding excise taxes and excise duties. The amount of transportation, storage, and trade margins added to the value of all goods purchased in bringing them to the user's site is shown in row 38 of this column of Table 1. Similarly the indirect taxes levied after manufacture is completed, if any, are shown in row 46.

From *Trade of Canada, 1949*, Volume III, data on merchandise imports were obtained and a procedure similar to that used in classifying domestic production was followed. Commodity flow estimates of personal expenditure on imported consumer goods were then made in a manner similar to those for domestically produced goods. The method by which the use of imported commodities by industries was established is described above. Because of the lack of information on the channels of distribution through which imported goods flow, it was assumed they followed the same wholesaler-retailer-purchaser channels as the similar domestically-produced goods. Estimates of customs duties, excise taxes, and provincial and municipal sales taxes were applied at the appropriate levels.

The estimates incorporated into the *National Accounts* for income-in-kind received by individuals were added to arrive at the total figure for personal expenditure on consumer goods.

When these figures had been obtained comparison was then made with the figures contained in Table 47 of the *National Accounts*. The figures obtained by the commodity flow method were then

adjusted to agree with the totals for various commodity groups shown in this table. In other words, the industry-of-origin classification was obtained from the commodity flow method while the totals were adjusted to agree with the figures used in the *National Accounts*.

(b) Services

The estimates of personal expenditure in Table 47 of the *National Accounts* were translated into an industry-of-origin classification. The sources and methods of the estimates are described on pp. 159-161 of the *National Accounts*.

(c) Net expenditure abroad

The expenditures of Canadian residents in foreign countries (less an adjustment for expenditure charged to business) is included in the row for imports. The expenditures of non-residents in Canada were not excluded from the above-mentioned estimates of personal expenditure on the output of the various industries and are, therefore, deducted in total in the unallocated row. These adjustments also cover net private remittances to non-residents to correspond to the contra-entry in the balance of payments components. To the extent that gifts in kind sent abroad do not appear in retail sales an estimate of their value is included.

(d) Unallocated

The unallocated row of the personal expenditure on consumer goods and services column contains the deduction for the \$303 million purchases of non-residents in Canada.

2. Government Expenditure on Goods and Services

The final output category "government expenditure on goods and services" is a final purchaser. It consists of the outlays of federal, provincial and municipal governments (including municipal school boards) for currently produced goods and services. The figures are obtained residually by eliminating other government expenditures or outlays which are not made directly to purchase new goods and services. Thus, subsidies, transfer payments to individuals and private non-commercial institutions, and transfers to other governments, losses of government owned enterprises, provisions for debt retirement, reserves, various bookkeeping adjustments, and purchases of land and used capital assets are excluded. The expenditure of the Post Office is classified as a government business enterprise and is included in the communication industry.

Government expenditure on goods and services includes both current expenditure and outlay on capital account for new buildings, highways, and so forth.

The details of the various expenditures for current expenses are shown in the inter-industry table in the industry in which the particular government establishment was classified. The final output category for government expenditure on goods and

services is shown as purchasing an amount of output of these establishments equal to their net expenditure on current account. Capitalexpenditure included in this final output category is shown as having been purchased directly from the industry which produced the capital goods.

(a) Current expenditure

The final output category "government expenditure on goods and services" is shown as having purchased all the output of the public administration and defence industry plus those portions of the output of the transportation, communication, wholesale trade and community service industries which were produced by establishments whose expenditure is included in "government expenditure on goods and services" in the *National Accounts*. In the case of the Canadian Broadcasting Corporation however, its output is split into two parts: (i) advertising revenue, which is treated as a sale to the business service industry, and (ii) the portion of its expenditure which is not covered by advertising and which is shown as if it were sold to the final purchaser "government expenditure on goods and services". The method by which the various output figures were arrived at is described in the section on inter-industry and imported input.

(b) Capital formation

The totals for capitalexpenditure were obtained from *Private and Public Investment in Canada, 1946-1957*. Since all construction is assumed to have been put in place by the construction industry, capital expenditure on new construction is shown as being purchased from the construction industry. To obtain an industry-of-origin classification of capital expenditure on machinery and equipment, the *Public Accounts* were examined and estimates made of the types of machinery and equipment on which the expenditure was made. Data on the production of Canadian industries and on merchandise imports were then examined and estimates made of the amounts that came from various industries or were imported.

Since the inter-industry flow table is at producers' prices, expenditure on the output of each goods-producing industry was shown at the value f.o.b. the producing industry, excluding excise taxes and excise duties. The amount of transportation, storage and trade margins added to the value of all goods purchased in bringing them to the user's site is shown in row 38 of this column of Table 1. Similarly the indirect taxes levied after manufacture is completed, if any, are shown in row 46.

3. Business Gross Fixed Capital Formation

(a) New construction

The figure for business expenditure on new construction is obtained from the *National Accounts*. Since all construction was assumed to have been put in place by the construction industry, this amount is shown in the inter-industry flow table as

having been purchased from the construction industry. All other items in column 47 of the table refer, therefore, to investment in new machinery and equipment.

(b) New machinery and equipment

The industry-of-origin estimates of investment in new machinery and equipment were made by the commodity flow method. As explained in the section on personal expenditure on consumer goods, for each industry, goods which would be considered as capital goods, in accordance with the definition of capital formation, were grouped together. From the total for each industry was subtracted the amount of these commodities exported and the amount which was included in the item "government expenditure on goods and services," valued at producers' prices. From this residual estimate of the production of new machinery and equipment was subtracted the change in inventories of machinery and equipment held by the manufacturers of these goods. The only data available were estimates of the total change in inventories of manufacturers' finished goods. To obtain the new machinery and equipment portion the total change was prorated according to the relative quantities of the various types of the commodities produced in that industry.

Where applicable, excise taxes were then applied to the value of shipments of new machinery and equipment. Estimates were then made of the percentage of shipments by manufacturers to wholesalers, to retailers, and directly to other industrial users and estimates were added for transportation costs incurred in shipping the item from the manufacturer to the distributor. An allowance had to be made at this stage for the disappearance of commodities into inventories at the wholesale level. Again the lack of commodity information on inventories held by wholesalers made this adjustment inexact. It was assumed that inventories at both the wholesale and retail levels were valued at cost although the practice might vary depending on individual accounting methods used by recording establishments. Where machinery and equipment was assumed to have been sold to the user by a wholesaler, the wholesale gross profit margin for the type of wholesale establishment through which the particular group of machinery and equipment items would have passed was added.

From data in the 1951 Census of Distribution, estimates were obtained of the percentage of wholesale shipments to retailers, and the percentage shipped directly to industrial users. An adjustment was made for change in inventories of retailers. To the portion that was assumed to have passed to a retailer was added the retail gross profit margin for the type of store through which the machinery and equipment would have passed. Where applicable, provincial and municipal sales taxes were added at this level.

Since the inter-industry flow table is at producers' prices, expenditure on the output of each goods-producing industry was shown at the

value f.o.b. the producing industry, excluding excise taxes and excise duties. The amount of transportation, storage and trade margins added to the value of all goods purchased in bringing them to the user's site is shown in row 38 of this column of Table 1. Similarly the indirect taxes levied after manufacture is completed, if any, are shown in row 46.

From *Trade of Canada, 1949*, Volume III, data on merchandise imports were obtained and a procedure similar to that used in classifying domestic production was followed. Commodity flow estimates of investment expenditure on imported machinery and equipment were then made in a manner similar to those for domestically produced goods. Because of the lack of information on the channels of distribution through which imported goods flow, it was assumed they followed the same wholesaler-purchaser channels as the similar domestically-produced goods. Estimates of custom duties, excise taxes, and provincial and municipal sales taxes were applied at the appropriate levels.

The total estimate of business gross fixed capital formation in machinery and equipment obtained from this method differed from the estimate in the *National Accounts*. The latter figure was accepted as correct and a pro rata adjustment made to the industry-of-origin estimates.

4. Value of Physical Change in Inventories

The net change during the year of business holdings of inventories must be included in the inter-industry flow table (at the value of the physical change rather than the change in book values) in order to allow for that portion of current production which has not yet been sold or to deduct that portion of the production of earlier years which has been included in this year's inputs into industry or in this year's expenditure by final purchasers. The entry in the inventory column and the row of the inter-industry flow table for a particular industry should show that part of the output of the particular industry in 1949 which represented the total change in the stocks of the commodities produced by that industry, regardless of who owned the inventory. This may include items owned by manufacturers, retailers, or wholesalers. It may include finished goods inventories, raw materials, or trading inventories of manufacturers. Thus, for the inter-industry flow table an attempt had to be made to take apart the figures for inventories owned by various industries (see Table 26 of the *National Accounts*) and put them together by adding the commodities produced by the same industry.

The procedure followed was to estimate from information supplied by the National Income Section the value of the physical change in finished goods inventories and in goods in process for commodity-producing industries. These amounts were entered in the inventory change column in Table 1 in the row of the industry owning the goods. It was assumed that these stocks, which include trading inventories, were produced within the same industry

group. The change in raw material inventories for each industry group was prorated according to the cost of the various materials used in that industry. In this manner the industry producing the materials was estimated. The inventories of wholesale and retail trade were converted to an industry-of-origin classification on the basis of the principal commodity group sold by the type of store holding the inventory. A large proportion of trade inventories could not, however, be allocated to a commodity group. This resulted in a large unallocated inventory change being shown in Table 1.

5. Exports of Goods and Services

The reader is referred to Parts III.A and III.B for a description of this item.

D. Gross Domestic Product at Factor Cost

Tables 21-24 of the *National Accounts* provided control totals for the industrial distribution of wages, salaries, and supplementary labour income; investment income; and the net income of unincorporated business. The sources and methods for those estimates are described in the *National Accounts* and are not repeated here. These notes indicate the adjustments made to extend the distribution to forty-two industries and to adjust to input-output concepts.

1. Wages, Salaries, and Supplementary Labour Income

The adjustments for wages of labour force engaged in own account construction were based on the following sources:

(i) For manufacturing industries the Census of Industry collects data on wages paid to own labour force on account of new construction. The ratio of wages to value of new construction put in place was used to estimate wages paid on account of repair construction.

(ii) For steam and electric railways, telephone companies, and government, data published in *The Construction Industry in Canada, 1949* were utilized. Some unpublished data were utilized to improve the estimate of wages and salaries paid by the electric power industry to construction workers.

(iii) For waterworks an adjustment was made on the basis of data collected in the 1951 survey of capital expenditure.

The adjustment for gas manufacture and distribution establishments was made on the basis of data collected by the Census of Industry.

2. Investment Income, Capital Consumption Allowances and Miscellaneous Valuation Adjustments

For the inter-industry study, corporation profits and other financial items, including capital consumption allowances and miscellaneous valuation adjustments, were distributed on an establishment basis.

In the National Accounts they are on an enterprise basis. In adjusting corporation profits from an enterprise basis to an establishment basis large adjustments were made (i) for forestry, wood products, and pulp and paper; (ii) among the iron and steel, transportation equipment, and non-ferrous metal products groups; and (iii) between many industries and wholesale trade.

Three principal adjustments were made to data in *Taxation Statistics, 1951*: (i) for not fully tabulated companies and for calendar year, (ii) for differences between the National Revenue and the Standard Industrial Classification codes, and (iii) for conversion from an enterprise basis to an establishment basis.

The first step was to group the National Revenue sub-groups as closely as possible to the inter-industry study groupings. Totals on this basis were obtained for depreciation, profits, and other financial items. The adjustment for not fully tabulated companies was made for each group on the basis of the profits (or losses) of all companies versus the profits (or losses) of fully tabulated companies.

Adjustments for calendar year were based on card runs showing totals by broad industrial groups and by the month in which their fiscal year ended. In order to obtain the detailed industry groups, it was assumed that the adjustments for each S.I.C. major group applied to each of the industry groups within the major group.

Adjustments were made for differences in coding. For example, the National Revenue code coded asphalt roofing companies under petroleum products while the Standard Industrial Classification coded them under paper products. In other cases, there were errors in coding. On the basis of available information, corrections were made for these coding differences and coding errors. (Recently the Department of National Revenue began coding according to the D.B.S. Standard Industrial Classification.)

The next step was to make the adjustments to convert from a company to an establishment basis for those companies which had establishments in more than one industry. The main source of information used for this purpose was a special card run prepared by the Labour and Prices Division from information on file at the Unemployment Insurance Commission. This card run grouped together all establishments under the same company, or, in some cases, under the same control. A card was made up for each company which had more than fifty employees in each of two or more industrial groups. (Information on the number of employees was listed on the card run.)

The number of manufacturing companies which had fifty or more employees in trade establishments was quite small, but a very large number had some employees engaged in trade. It did not appear that very useful results could be obtained if only the

companies with fifty or more employees in trade were studied, while it would be impossible to study separately all the small companies. The *Census of Canada, 1951*, Volumes VII and VIII provided a different method of estimating the proportion of the profits of manufacturing companies which should be credited to trade establishments. In these volumes there is shown the wages and salaries paid by manufacturing companies to employees engaged in trade. These wages and salaries were compared with the total wages and salaries in manufacturing for 1951 obtained from Census of Industry manufacturing reports and the ratio obtained. This ratio was then multiplied by the 1949 profits of manufacturing corporations, giving an estimate of the profits to be transferred to trade. This was done separately for wholesale and retail trade, although the adjustment for retail trade was very small since there are few manufacturing companies engaged in retail trade. (Paint stores, for example, are classified in wholesale trade since most of their trade is with builders.) The same procedure was followed for depreciation.

For the adjustment between other industries, the companies operating in two or more groups with over fifty employees in each group were selected. On the basis of either gross value of production or employment, profits and depreciation were divided among the groups in which the company operated.

As originally planned, there was to be a much more elaborate method of estimation. The rate of profit on sales would be estimated for each industry group and this rate applied to the portion of sales of a company in each industry group to obtain an estimate of profits. These profit estimates, which would ordinarily total too high or too low, would then be adjusted to add up to the profits of the original company. This method was discarded for several reasons: (i) For groups such as paper products and forestry, no good rate of profit could be found for paper products, exclusive of forestry. (ii) For wholesale trade a different approach was used which by-passed the ordinary methods and made this step unnecessary. (iii) Where a company was engaged in service, finance, or some other group for which the Bureau does not have production figures, employment was used since the proposed method did not apply.

After adjustments were made individually for the larger companies selected, an overall adjustment, based on a study made for 1946, was made. Companies which were treated individually were removed from the 1946 totals and a percentage adjustment made, based on wages and salaries of remaining companies. This adjustment was quite minor in scope because larger companies accounted for most of the adjustments.

The allocation of profits just described is obviously subject to considerable error. In particular, no allowance is made for cases where one establishment makes a profit and another establishment of the same company has a loss. In cases

where a paper products company owns and operates a forestry division, the profits earned in the forestry division depend on the price assigned to the pulpwood by the parent company. This may be a purely arbitrary price. The same applies to companies which mine, smelt, and manufacture non-ferrous metals and their products.

It may be, however, that as enterprises diversify their activities, changes in direction through time may occur even though the absolute differences are small. For example, some enterprises have establishments in both the textile and chemical products industries. Establishments in the textile industry could be making losses which are offset by profits of the establishments in the chemical industry. The effect of this would be lost in an enterprise distribution of profits. Unfortunately, however, the methods used at present in allocating profits on an establishment basis would probably not result in a loss being shown in the textile industry. This is one of the difficulties that must be overcome before a more satisfactory establishment distribution of profits can be obtained.

The procedure described for profits also applied to other investment income (interest and net rental income of persons; and government investment income, including profits of government business enterprises) and capital consumption allowances and miscellaneous valuation adjustments.

3. Net Income of Unincorporated Business

This item is published by major groups in the *National Accounts*. The principal breakdown required was that for manufacturing. Data on gross value of production of unincorporated business (excluding co-operatives) were obtained from the Census of Industry and adjusted to include estimated receipts of unincorporated repair establishments. The net income of unincorporated manufacturing business was then distributed according to gross value of production. For other industries where industry groupings were finer than the published groupings, the National Income Section made estimates of the allocation of net income, based on Census employment data and other sources. At the level of industrial grouping used for the inter-industry flow study, the difference between classifying unincorporated business on an enterprise and on an establishment basis is negligible.

4. Inventory Valuation Adjustment

The figures for the inventory valuation adjustment included in Table 21 of the *National Accounts* are included in row 51 of the table.

E. Indirect Taxes and Subsidies

1. Indirect Taxes

Totals for the various types of taxes are published in Table 40 of the *National Accounts*. Further details on these taxes (on a fiscal year

basis) are available in the Public Accounts of the various governments.

(a) Customs import duties

By the same process that merchandise imports were allocated to the using industry, customs import duties were also allocated.

(b) Excise duties, excise taxes, gasoline taxes, retail sales taxes, and amusement taxes

These taxes comprise part of the spread between producers' and purchasers' prices or are taxes on imported commodities. The taxes were therefore allocated to the industry or final purchaser using the taxed commodities by the same methods that transportation and storage costs, trade margins, and other components of spread were allocated.

(c) Other indirect taxes

The taxes on banks and insurance companies could be allocated directly because of the nature of the tax. The manufacturing share of real and property taxes was allocated in accordance with the method for distributing miscellaneous input described on page 37. The portion paid by other industries was distributed on the basis of information published in various industry reports. An estimate of taxes on residential property was obtained from the National Income Section.

2. Subsidies

Subsidies represent amounts contributed by governments towards current costs of production.

Data on subsidies are published in Table 45 of the *National Accounts*. Further details are also available in the Public Accounts of the various governments.

F. The Quality of the Estimates

The value of input into an industry was defined to be identical with the value of output of that industry. If total input could have been estimated independently of the estimate of total output, the discrepancy between the two estimates would have provided an indicator of the accuracy of the data comparable to the residual error of estimate in the *National Accounts*. Since recent data on such inputs into manufacturing as property taxes, professional fees, office supplies, rent, telephone, telegraph, and so forth, were unavailable, the total of such inputs into each manufacturing industry was estimated residually by subtracting the total value of all other inputs from the value of total output of the industry (see p. 37). Since total input for most industries was not estimated independently of total output, the main check on accuracy which a balancing set of accounts provides was not available for the 1949 inter-industry study.

TABLE 12. The Quality of Estimates of the Inter-Industry Flow of Goods and Services, 1949

	Agriculture	Forestry	Fishing and mining	Manufacturing	Construction	Other industries	Personal expenditure on consumer goods and services	Government expenditure on goods and services	Business gross fixed capital formation	Value of the physical change in inventories	Exports of goods and services	Total output
Agriculture	B-C	C-C	B-C	A-C	...	C	B	B	B	C	A	A
Forestry	B-C	...	B-C	A-C	B	C	C	...	...	C	A	A
Fishing and mining	B-C	C-C	...	A-C	B	C	C	...	...	C	A	A
Manufacturing	B-C	C-C	B-C	A ¹ -C	B	C	B	C	B	C	A	A
Construction	A	A	A	A	A	A	...	A	A	...	...	A
Other industries	C	C	C	C	C	C	C	A	C	C	B	B
Imports of goods and services	B	B	B	A ¹	A	C	B	C	B	C	A	
Indirect taxes on imported goods and services	B	B	B	A	A	C	C	C	C	C	B	
Indirect taxes less subsidies on domestic goods and services	C	C	C	C	C	C	C	C	C	C	...	
Wages, salaries, and supplementary labour income	A	B	A	A	B	B	...	...	...	...	...
Investment income	B	B	B	B	B	B	...	...	...	...	...
Net income of unincorporated business	B	B	B	B	B	B	...	...	...	...	...
Capital consumption allowances and valuation adjustments	B	B	B	B	B	B	...	...	...	...	...

¹ Within the manufacturing group C's instead of A's should be given to the clothing, transportation equipment, non-metallic mineral products, and miscellaneous manufacturing industries because some components of these industries did not report data on materials used.

A second important limitation on the balancing of the table was the difficulty of estimating the distribution costs and indirect taxes which comprise the "spread" between producers' and purchasers' prices. In some cases it was assumed that, where the independently estimated components of output did not add to the total output for the industry, the error was in the estimate of spread and this component adjusted accordingly.

Because of these two problems, there are no separate figures for the residual errors of estimate of input and output. The unallocated input row contains the figure for unspecified materials and services used in the industry and the unallocated column contains mainly products which were not sufficiently identified on the Census schedules to determine their use. Further explanation of some of the entries in these unallocated cells may be found on page 41.

It is clear from the description of sources and methods that the error of the estimates of the 1949 inter-industry flow table cannot be calculated quantitatively. A qualitative rating has been given to the estimates, however, despite the fact that it was difficult to always give a clear-cut classification to an estimate in a cell of the table since the figure may be the sum of several estimates of varying quality. Some inputs from manufacturing into manufacturing, for example, are the sum of fairly accurate estimates of the industry of origin of materials used plus less reliable estimates of the industry of origin of repair expenditure on machinery and equipment. It was decided, therefore, to classify by three broad categories: A, B, and C. The criteria for classifying an estimate into one of these categories are:

A: The basic data were collected on a survey such as the Census of Industry or were obtained from

published accounting statements, and very little adjustment was required to translate the data into an industry-of-origin classification. Materials used for manufacturing industries are a typical example.

B: The basic data were collected on a survey or from accounting statements but it was more difficult to translate them into an industry-of-origin classification. The "commodity flow" estimates of personal expenditure on consumer goods at producers' prices, for example, were given this classification.

C: The estimates were inferred from inadequate basic data or from data which were in such a

form that it was very difficult to translate into an industry-of-origin classification. An example of the former are the inputs from service industries into manufacturing; an example of the latter are the inputs into government service.

Material inputs into commodity-producing industries have been given a rating of (A-C) or (B-C) to indicate that the estimates are obtained by taking the difference between two separate estimates and that the quality of the purchasers' price component is better than the quality of the estimate that was subtracted to bring the total to producers' prices.

TABLE 1. The Inter-Industry Flow of Goods and Services, Canada, 1982

(producers' prices in millions of dollars)

[illegible]

* The construction industry includes all new and repair construction, including construction put in place by the armed and naval forces of other industries. * All rented non-residential property and all residential dwellings, owned or rented, are included in this industry group. * The community, recreation, business, and personal services industries and the public administration and defence industries are included in this group. * The value of imports is estimated c.i.f. port of entry. For the basis of valuation of exports, see page 109. * Military pay and allowances of \$115 million are included in wages and salaries paid by the public administration and defence industry. * This item includes the miscellaneous valuation adjustments and the inventory valuation adjustments. * And: Estimate in rows 47 to 54 and in column 42 to 50, see the notes in the next group of tables. * All other imports.

TABLE 2. Input into Each Industry per Dollar of Output¹ of the Industry, Canada, 1949[illegible]

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